Offensive Capability and Potential Usage:
The American Biological Warfare Program During World War II

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I. Introduction

The United States developed a new type of weapon during World War II that could have killed millions of people. Instead of using it, the United States dropped atomic bombs. Biological warfare capability became a reality in the United States through secretive, intensive, and collaborative efforts of civilian and military personnel during this period. The development of atomic weapons followed a similar track but became a worldwide focal point after the destruction of Hiroshima and Nagasaki in 1945. President Harry Truman explained his choice between the two then-secret weapons on his last full day in office in 1953 in a letter to his friend Thomas Murray, who was the Commissioner of the Atomic Energy Commission. Truman disclosed in that letter: "I rather think you have put a wrong construction on my approach to the use of the atomic bomb. It is far worse than…biological warfare because it affects the civilian population and murders them by the wholesale."[1] Notwithstanding President Truman's opinion about the comparative lethality of these new weapons, this fascinating passage introduced the specter of another form of warfare—biological—that had been largely unknown to outsiders and rarely been suggested as a potential weapon for the United States to deploy in World War II or any other war.

The questions that arise from this message compel an examination of American biological weapons efforts and priorities during World War II. Such an examination will reveal whether the scope and purposes of the American Biological Warfare Program—which undoubtedly did exist—included development of offensive biological weapons at some point during the War. Further, did Truman's words offering a comparison between the deadly effects

[1] Harry S. Truman to Thomas Murray, "Harry S. Truman to Thomas Murray," January 19, 1953, Harry S. Truman Library.

of atomic and biological weapons reveal that the United States was prepared to use biological weapons?

The terrifying prospect of biological weapons being employed against unsuspecting civilians is highly relevant in modern times. These fears have only intensified through stories that the COVID-19 virus may be a biological weapon. Two of the world's superpowers—China and the United States—have leveled accusations at one another that the virus was the product of offensive biological weapons research. Specifically, the Chinese have alleged that the United States released the virus from its former biological weapons research facility at Fort Detrick in Maryland. Some in the United States have countered this accusation with an accusation of their own: that the virus originated from a virology lab in Wuhan, China and was purposefully released by the Chinese government.[2] Further, the United States and Russia in March 2022 have respectively raised the possibility that the other might be responsible for the use of biological weapons in Ukraine. While this thesis will not directly address the accusations leveled by the United States, China, or Russia, these current conflicts magnify the importance of understanding the origins and purposes of the American Biological Warfare Program (hereinafter "the American BW Program" or "the Program") during World War II.

Biological warfare is defined as the release of biological agents and/or micro-organisms that multiply, spread, and harm living things such as humans, plants, and animals.[3] This type of warfare is frequently confused with chemical warfare. Chemical warfare is defined as the use of chemical agents, such as mustard gas, to maim and kill. While chemical weapons were a feature

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[2] Jing Bao Nie, "In the Shadow of Biological Warfare: Conspiracy Theories on the Origins of COVID-19 and Enhancing Global Governance of Biosafety as a Matter of Urgency," *Journal of Bioethical Inquiry* 17, no. 4 (December 17, 2020).

[3] Maj. Gen. William N. Porter to Commanding General, Army Service Forces, "Biological Warfare: History, Present Status, Plans for the Future," February 3, 1944, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.

in warfare before the twentieth century, this form of warfare is most notably associated with World War I and the mustard gas that multiple countries utilized. Chemical warfare was not strictly relegated to World War I, though.[4] Indeed, chemical warfare was on the minds of high-ranking United States officials and many feared that the Axis powers would utilize this form of weaponry at battles such as the storming of Normandy Beach.[5]

In contrast to chemical warfare, biological warfare was a relatively new concept by the start of World War II. Biological warfare can affect troops and entire populations. Biological agents, as one major general noted in 1944, may be "at least 150,000 times as toxic as Chemical Warfare agents" and can cover "hundreds of thousands of square miles" rather than the smaller "tens of square miles" scope that chemical warfare can affect.[6] Thus, there were, and still are, major concerns that biological weapons could cause epidemics amongst multiple countries and populations.[7] Biological warfare can last much longer than chemical warfare; months can pass without a population becoming aware that they have been attacked and the spread of biological agents can persist in an area for years at a time.[8] Biological warfare is silent as well as invisible, and defending against it is thus highly difficult. As this thesis will discuss later, the United States has endeavored to find ways to defend itself in the case of a biological attack.

There has been a lack of attention paid to the American BW Program during World War II by historians and scholars generally. Although it did not receive as much monetary funding and attention as the Manhattan Project, the American BW Program employed about 4,000

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[4] Leonard A. Cole, *Clouds of Secrecy: The Army's Germ Warfare Tests Over Populated Areas* (Rowman and Littlefield, 1990).
[5] Barton J. Bernstein, "The Birth of the U.S. Biological-Warfare Program," *Scientific American* 256, no. 6 (1987): 116–21.
[6] Ibid.
[7] World Health Organization, "Health Aspects of Chemical and Biological Weapons" (Geneva, 1970).
[8] Cole, *Clouds of Secrecy*, 5.

workers and over $40 million was spent on it during the War.[9] But perhaps this lack of attention is not so surprising because, as a recently declassified 1944 Pentagon memorandum acknowledged, it was "necessary to carry on BW work strictly subrosa, on verbal directives not officially approved in writing, with operations limited to a very small group of selected people."[10]

The first real breakthrough in academic discussion about the American BW Program during World War II—albeit in a limited way—came from Dr. Theodor Rosebury, a Columbia University Professor and bacteriological researcher at Camp Detrick in Maryland (now known as Fort Detrick). Rosebury was integral to the American BW Program's identification of potential micro-biological agents that could be used in the War. After the War, Rosebury became disillusioned with the prospect of biological weapons and future wars built on his research and that of his colleagues. He wrote of the dim reality of defending against these types of weapons and highlighted in the *Journal of Immunology* numerous deadly biological agents that could be used to harm humans. Rosebury observed that there was almost no defense against a biological attack.[11]

In 1949, Rosebury published *Peace of Pestilence? Biological Warfare and How to Avoid It* and transformed the scholarship on the topic of biological warfare. It was not a historical work but instead focused on informing the public about the study of biological weapons and the implications of this type of warfare. The book was filled with personal anecdotes of his experiences working at Camp Detrick, his own findings on biological agents, breakthroughs that

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[9] Lt. Comdr. William B. Sarles, "Report of Meeting, 28 December 1944" (Washington, D.C., December 28, 1944), RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[10] "Notes for Use at 'BWC' Meeting," November 22, 1944, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[11] Theodor Rosebury and E. A. Kabat, "Bacterial Warfare: A Critical Analysis of the Available Agents, Their Possible Military Applications, and the Means for Protection Against Them," *Journal of Immunology (Baltimore, Md.: 1950)* 56, no. 1 (May 1947).

other scientists made, and the possible consequences of a biological attack.[12] In every aspect of the book, Rosebury was intensely critical of the American BW Program during World War II and advocated against any use or proliferation of biological weapons in the post-World War II era.

The United States government was highly secretive about the American BW Program during and after World War II largely for strategic reasons. An added reason for this secrecy during the War was the prospect of alarming the public about the chance of a biological attack.[13] In April 1944, for example, the Joint Security Council emphasized that operations of the American BW Program were strictly secretive and admonished against "possible leakages not only to the enemy but to the American people."[14] After Rosebury's controversial book and his critical view of the American BW Program, the United States redoubled its efforts to prohibit the release of information. Documents relating to the American BW Program were classified and kept from the public's view.

Political scientist Barton J. Bernstein produced new scholarship on the American BW Program after increased interest in biological weapons during Ronald Reagan's Presidency. Although Bernstein's work was written and published in the late 1980s, four decades after World War II, the topic was still largely unexamined. Bernstein's work centered on the origins of the American BW Program and its roots in American universities like Harvard and Columbia.[15] He argued that the American BW Program was driven by the faulty notion that Nazi Germany was developing biological warfare capability. Bernstein also importantly connected his scholarship to

[12] Theodor Rosebury, *Peace or Pestilence* (Whittlesey House, 1949).
[13] George W. Merck, "Memorandum to Mr. Harvey H. Bundy, Special Assistant to the Secretary of War," June 3, 1944, RG 165, NM84, Box 173, National Archives at College Park, MD.
[14] "Classification on the Subject of B.W.," April 1, 1944, RG 165, NM84, Box 175, National Archives at College Park, MD.
[15] Barton J. Bernstein, "The Birth of the U.S. Biological-Warfare Program."

Rosebury's *Peace or Pestilence*, not only neatly tying together works from decades apart, but also enabling him to touch on the moral experiences and doubts that many of the American BW Program's scientists possessed.[16] Thanks to Bernstein and other scholars, the topic of biological weapons was thereafter discussed more openly by historians and those in the United States government. The topic even appeared in a military medicine textbook that acknowledged the Program's existence during World War II.[17]

Biological warfare once again became a topic of interest as a result of the anthrax terrorist attacks following September 11, 2001. But scholarship focused on the American BW Program during World War II was relegated to a mere case study regarding the proliferation of biological weapons and their possible usage against the United States and its allies. Jeanne Guillemin was key in discussing bioterrorism and published numerous works such as her 2005 book, *Biological Weapons: From the Invention of State-Sponsored Programs to Modern Bioterrorism*.[18] Major topics in Guillemin's works included the creation of biological warfare programs throughout history, a brief discussion of the American BW Program's start during World War II, and details about many state and terrorist groups' beliefs that their own biological weapons program were needed to combat their enemies.[19]

Still, there is a dearth of historical scholarship that exists on the American BW Program during World War II specifically. The American BW Program directly after World War II, however, is one of the most academically researched eras in biological warfare history. Many

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[16] Barton J. Bernstein, "America's Biological Warfare Program in the Second World War," *Journal of Strategic Studies* 11, no. 3 (September 1, 1988): 292–317.
[17] Brig. Gen. Russ Zajtchuk, *Medical Aspects of Chemical and Biological Warfare* (Office of the Surgeon General, 1997).
[18] Jeanne Guillemin, *Biological Weapons: From the Invention of State-Sponsored Programs to Contemporary Bioterrorism* (Columbia University Press, 2006).
[19] Jeanne Guillemin, "Scientists and the History of Biological Weapons: A Brief Historical Overview of the Development of Biological Weapons in the Twentieth Century," *EMBO Reports* 7 (July 2006): S45–49.

scholars believed that the United States had no more use for a large-scale biological weapons program after World War II. This belief was challenged by Stephen Endicott and Edward Hagerman. The duo claimed that the American BW Program was still very active in the years following World War II and even argued that the United States used biological weapons against Korea and China during the Korean War.[20] Their work also briefly touched upon the American BW Program during World War II but was most notable for its assumption that the United States was determined to produce offensive biological weaponry after World War II was won.[21]

The obvious comparator to the American BW Program was the only other weapons research program that rivaled its scope in all of American history—the Manhattan Project. The American BW Program has been subject to far less examination than the Manhattan Project. An obvious reason for this disparity in scholarship and public attention was the United States' use of atomic weapons at the end of World War II, catapulting this American innovation into the spotlight and atomic weapons into the fore of public discourse for the decades following it. There have been numerous historical accounts of the Manhattan Project and they highlight the details of the project and the relationships between the civilian and military personnel and the scientists working on the atomic weapons much more exhaustively than any historical work on the American BW Program during World War II. In a particularly revealing study regarding the head of the Manhattan Project, General Leslie R. Groves, atomic weapons scholar Robert S. Norris described the fraught relationship between scientists and government officials and the constant disagreements the two sides had over the management of the atomic weapons program. Norris also detailed the false optimism that many scientists working on the Manhattan Project

[20] Stephen Endicott and Edward Hagerman, *The United States and Biological Warfare: Secrets from the Early Cold War and Korea* (Indiana University Press, 1998).
[21] Ibid.

possessed. While many scientists believed that their atomic weapons would be internationally controlled and regulated, governmental officials did not subscribe to this belief and allowed the massive and unilateral proliferation of atomic arms starting a few years later.[22] As will be discussed below, similar conflicts occurred within the American BW Program. But unlike the Manhattan Project, the American BW Program during World War II yielded many significant advances in healthcare that have benefited humanity. For instance, research during this period has led to much of the personal protective equipment including masks used during the COVID-19 pandemic.[23]

There are large gaps in the historical literature on the American BW Program that are ripe to be considered. Not only has the topic of the American BW Program been overlooked by many historians, but also it has been difficult to analyze due to the secrecy that has surrounded the Program during and since World War II. Thankfully, in recent years, the United States has declassified materials about the American BW Program. These declassified documents and other materials cover the initial years of the American BW Program and provide the opportunity to allow historians to examine this topic from a new and better-informed perspective. I made Freedom of Information Act requests of the United States and studied thousands of documents from the National Archives to support this thesis. But government secrecy about the American BW Program persists. For instance, I discovered that the United States has actually re-classified and removed from the public's view previously declassified materials from the 1940s about American BW Program topics including anthrax and brucella generated at Camp Detrick.[24]

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[22] Robert S. Norris, *Racing for the Bomb: General Leslie R. Groves, the Manhattan Project's Indispensable Man* (Steerforth, 2003).
[23] Jeff Johnson, "Respirator Filter Expert Simon Smith Explains What's in a Mask and What Drives PPE R&D," *ACS Chemical Health & Safety*, no. 28 (September 14, 2021): 293–94.
[24] Young, "Special Report #28 Access Restricted," January 1, 1946, RG 175, NM84, Box 2, National Archives at College Park, MD; "Special Report #84 Access Restricted," August 21, 2002, RG 175, NM84, Box 3, National Archives at College Park, MD.

Utilizing these new primary sources as well as the secondary literature I have already described, this thesis traces the development of the American BW Program through World War II. I argue that the direction of the Program depended on the particular wartime period, with civilian scientists driving a largely defensive focused program early on, and a newly interested military taking control and expanding this focus later in the War. I also contend that the United States had offensive biological weapon capabilities by the end of World War II. Finally, I argue that American military officials planned to use these offensive biological weapons to end the War in the Pacific theater if the conflict progressed further into 1945.

This paper is segmented into distinct sections to address critical points. Section II analyzes the creation of the American BW Program and the many initial justifications that were urged for its existence. It sets the backdrop for the rest of the paper, such as by explaining the chemical warfare of World War I and other countries' biological warfare programs, and by discussing how and why the American BW Program functioned throughout the War. Importantly, section II focuses upon the changing roles and relationships of scientists and the military in determining the direction of the Program. Section III addresses the American BW Program's research and the offensive capabilities that it possessed during the War. It provides evidence and analysis to support my claim that the United States did indeed possess offensive biological weapon capabilities and delves into the specifics of its biological weapons and research centers. Section IV takes my claim that the United States had offensive capabilities and supports my argument that it would have deployed these weapons. Possible candidates for biological weapon utilization are introduced, as well as the moral, legal, and strategic deliberations surrounding these weapons' potential use. The thesis concludes in section V with implications of these findings and the current importance of this historical topic.

II. The American Biological Warfare Program: Late to the Microbial Party, but America's Slow Movement to the Fore

By the time World War II ended in the summer of 1945, large amounts of funding and energy had been devoted to the American BW Program. In fact, the American BW Program was the most advanced in the world. This superiority was surprising because the Program started in late 1941, at a time when other countries' programs were well underway. Although countries like Japan, Great Britain, and the Soviet Union were focused on biological warfare development in the interwar period, the United States had remained largely skeptical of this type of warfare for the majority of the period and did not begin its program until World War II had begun.

This section addresses the transition from the international focus on chemical warfare to biological warfare, the Geneva Protocol of 1925 which aimed to prohibit many countries' new biological weapons programs, and the eventual beginning of the American BW Program in 1941. It also provides important background information about many of the institutional details of the American BW Program. Finally, and importantly, this section analyzes who supplied the vision and direction for the American BW Program during World War II. I argue that the Program's priorities as a civilian-led organization at its inception changed markedly as it evolved into a War Department-led program.

A. The Geneva Protocol of 1925: A Failed Attempt at Curtailing Biological Warfare

Many political leaders and scientists in the international community were stunned by the emergence of and destruction caused by chemical warfare during World War I. While chemical warfare was not new, its utilization in the Great War was unlike anything seen before, killing

over 90,000 soldiers and leaving countless others with permanent injuries and disabilities.[25] Mustard gas was particularly popular and used heavily in the trench warfare that engulfed large swaths of Western Europe. After World War I, officials from countries involved in the conflict were motivated to do away with this form of warfare immediately. Much of the immediate post-war policy was thus centered on chemical warfare in new international organizations like the League of Nations.

The first and most crucial interwar attempt at banning all chemical weapons took the form of the Geneva Protocol in 1925. The Protocol started out as a simple enhancement to the treaties drawn up at the 1922 Washington Disarmament Conference hosted by the United States. The main goal of the Protocol was to ban the export of chemical weapons, and it was a relatively contained and non-controversial treaty that almost all countries supported.[26] After some deliberation in 1925, though, a ban on biological warfare was inserted into the treaty by Poland's representatives. This marked a departure from the initial scope of the Protocol by prohibiting two types of warfare, chemical and biological, when biological warfare had rarely, if ever, been utilized in warfare. The Protocol famously declared "that the High Contracting Parties, so far as they are not already Parties to Treaties prohibiting such use, accept this prohibition, agree to extend this prohibition to the use of bacteriological methods of warfare and agree to be bound as between themselves according to the terms of this declaration."[27]

Notably, the United States never ratified the Geneva Protocol of 1925. Heavy lobbying by the Army Chemical Corps and those in the American chemical industry were the main driving forces behind the Senate's lack of ratification. Lobbying chemists sought to avoid being

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[25] Barton J. Bernstein, "The Birth of the U.S. Biological-Warfare Program."
[26] Rodney J. McElroy, "The Geneva Protocol of 1925," *The Politics of Arms Control Treaty Ratification*, n.d., 126.
[27] "Geneva Protocol (Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gasses, and of Bacteriological Methods of Warfare)," June 17, 1925, U.S. State Department.

hamstrung by international laws that would prevent them from continuing their research and maximizing future profits.[28] In addition, many United States government officials pushed back heavily against international laws and institutions (like the League of Nations) in the interwar period. The Senate's lack of ratification fits into this historical pattern.

The Geneva Protocol aimed to stop the research and development of biological weapons before many countries had even begun to consider creating their own programs. In this sense, the Protocol was a preemptive measure against biological warfare. But the Protocol did very little to stop countries such as Great Britain, France, and the Soviet Union from continuing to research biological weapons. The "no first use" policy memorialized in the Protocol enabled these countries to justify producing biological weapons for retaliatory purposes.[29] The use of gas in World War I was significant in prompting these countries to develop programs. Americans watching from the sidelines understood the dynamics at play in Geneva. Pharmaceutical mogul George W. Merck, who would later be the civilian leader of the American BW Program, pointed out that there was a general "suspicion" among many of the world's powers that their enemies were producing biological weapons and thus these nations, fearing for their security, continued their research even after international agreements like the Protocol bound them.[30] Ironically, the Protocol also put many countries on notice about this type of warfare and jump-started their own programs. As Merck observed, "the fact that the use of biological warfare weapons was outlawed by international agreement was no deterrent. In fact, it is probable that such restriction actually produced an even greater interest in the subject."[31]

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[28] Jeanne Guillemin, "Scientists and the History of Biological Weapons."
[29] Ibid.
[30] "Biological Warfare: Activities and Capabilities of Foreign Nations," March 30, 1946, RG 319, Box 101, National Archives at College Park, MD.
[31] Ibid.

B. Biological Weapons Research in the Interwar Period

The Geneva Protocol of 1925 exposed many in the international community to the prospect of biological warfare and many countries began to research these weapons directly after World War I ended. The successes of chemical warfare caught the eye of world powers and naturally made them consider whether biological warfare was possible. Indeed, plagues had ravaged battlefields for centuries, but this was the first time that countries considered putting substantial funding into military use of disease. As early as 1921, countries at the League of Nations discussed biological warfare. All of the scientists brought in to testify about biological warfare, such as the influential Richard Pfeifer of Germany, agreed that it was feasible and effective.[32] The stage was set for many countries to begin their research.

Use of biological weapons was not without precedent before World War II. Some believed, for instance, that the Germans used limited forms of biological warfare in World War I. Rumors circulated that they contaminated wells filled with drinking water, released typhoid from its airplanes, and dropped cholera in the Breslau River.[33] Even Merck believed that evidence demonstrated that the Germans inoculated horses in transit to the United Kingdom from the United States with infectious and deadly diseases.[34]

This use (or purported use) of biological weapons by the Germans in World War I made other European powers such as Great Britain, France, and the Soviet Union concerned about their potential use in future wars. As explained above, the Geneva Protocol of 1925 was not successful in stopping the research and development of biological warfare programs and

[32] Chief of Staff R. K. Sutherland and C. A. Willoughby, SCAP/G-2, "The Truth about Bacteriological Warfare," March 15, 1944, RG 165, Box 283, National Archives at College Park, MD.
[33] Ibid.
[34] George W. Merck, "Final Report to the U.S.B.W. Committee," n.d., RG 164, NM-84 Box 18, National Archives at College Park, MD.

European powers continued their programs. The Soviet Union conducted substantial research on biological weaponry, much more than any of its counterparts. Its biological weapons program began in 1925 and experimented with anthrax and botulinus. The communist power was confident that biological weapons could be utilized in warfare as means of sabotage and interwar American intelligence suggested that it was part of the Soviet Union's wartime strategy for future conflicts. The Soviets were also very worried that the Germans would employ biological weapons against them and prioritized research that focused upon defensive measures.[35] The United Kingdom and France similarly researched biological weapons, as in their view Germany and other countries might resort to using them. Both had considerable programs themselves, but they were not as vast as the Soviet Union's interwar program.[36]

Other than the Soviet Union, there were rumors of equally vast biological weapons programs in the eventual-Axis countries of Germany and Japan. Germany's enemies were skeptical after World War I that it would resume its program. While much of the intelligence on the advances of a German program was eventually debunked after the successful Allied invasion at the end of World War II, many European powers were concerned that the Germans "had almost a ten years' start" on them before their own biological weapons programs were started.[37] This threat was heightened in the years before World War II by British Journalist Wickham Steed in his July 1934 publication "Aerial Warfare: Secret German Plans." Steed alleged that he possessed classified German documents outlining successful biological weapons testing in the metro stations of London and Paris.[38] While the claims were never proven, Steed's article created

[35] N. Davidson, "The Role of Scientific Discovery in the Establishment of the First Biological Weapons Programmes," *University of Bradford* 5 (2005).
[36] Sutherland and Willoughby, "The Truth about Bacteriological Warfare."
[37] "Probable Biological Agents Which May Be Employed by the Enemy," January 1, 1944, RG 165, NM84, Box 171, National Archives at College Park, MD.
[38] Wickham Steed, "Aerial Warfare: Secret German Plans," *Nineteenth Century and After*, July 1934.

hysteria among those in both the United Kingdom and France. This prompted both governments to take immediate action by reassuring their citizens in public, while doubling down on their own programs in private.[39]

Another threat in the biological weapons sphere was Japan. Japan was the only major power other than the United States to not ratify the Geneva Protocol of 1925 and other countries wondered whether Japan possessed its own program. As World War II grew closer, it was apparent that Japan had a biological warfare program and was devoting large amounts of funds and attention to it. It was also believed that Japan was not afraid to use this type of warfare against its enemies on the battlefield. There was evidence to suggest that the Japanese military used gas numerous times in its conquest of China in the 1930s.[40] While the United States would not know the full extent to the Japanese program until after World War II, it was clear that Japan was a dangerous biological weapons threat and had a history of using chemical warfare against its enemies.

C. American Hesitancy on Biological Warfare and Its Eventual Awakening

Surprisingly, the United States was an outlier in terms of its lack of interest in biological warfare notwithstanding the fact that it failed to ratify the Geneva Protocol. The United States' lack of interest in biological warfare stemmed from its belief that such warfare was simply not feasible. Episodic events such as the prospect of enemies inoculating individual horses with biological agents did not motivate concern amongst United States military and political officials.

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[39] Edward Regis, *The Biology of Doom: America's Secret Germ Warfare Project*, First edition (New York: Henry Holt, 1999), 13.
[40] Lt. Col. David Barrett, "Japanese Attempts to Create Plague in North China," April 25, 1942, RG 165, Box 176, National Archives at College Park, MD.

While the United States was aware that biological warfare was being considered in the international sphere, top American scientists were convinced that biological warfare was not practicable because biological agents could not be spread effectively. Also, many American biologists thought that even if biological weapons could be effectively delivered, it would be nearly impossible to inoculate the American population against a possible attack.[41] Scientists from other countries felt quite differently.

The main driving force motivating the American hesitancy in pursuing biological weapons was Dr. Leon Fox, a well-respected major of the United States Army Medical Corps. Fox criticized opponents of his views on biological warfare as relying upon pseudo-science. He published "Bacterial Warfare: The Use of Biological Agents in Warfare" in *Military Surgeon* in March 1933 to rebut many in the United States and the larger international community who were concerned about this type of warfare. Fox cited reasons such as the difficulty in delivering biological agents, the fear that using biological weapons could infect one's own military, and the fact that many biological agents were susceptible to destruction in varying environmental conditions.[42] Other scientists agreed and Fox's article and public criticism of this "pseudo-science" garnered a national audience and held immense weight among those in the military.

While its future allies were grappling with the fallout from Steed's revelations about possible biological weapon testing in Great Britain's metro stations, the United States continued to reject the notion that biological warfare was possible and relied heavily upon trusted scientists like Fox. It was not until the few months before World War II began in Europe that United States officials began to reconsider their interwar position on the subject.

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[41] Regis, *The Biology of Doom*, 11.
[42] Maj. Leon Fox, "Bacterial Warfare: The Use of Biological Agents in Warfare," *Military Surgeon*, March 1933, 563–79.

The United States was awakened to the international threat of biological weapons in a manner only comparable to the plot of a modern spy thriller. Business was progressing as usual at the Rockefeller Institute for Medical Research in New York, New York in early 1941. This was until Ryoichi Naito, a microbiologist from Kyoto University in Japan, appeared and requested samples of yellow fever from those in the Institute, purportedly to help make a vaccine in Japan.[43] Rockefeller Institute scientists denied Naito's request due to existing bans by bodies such as the League of Nations on transporting yellow fever to Asia. In addition, the scientists knew that there was no yellow fever in Japan (where its environment would make it difficult to spread). Those at the Rockefeller Institute who spoke with Naito were alarmed by his inquisitiveness about the Institute's projects and on yellow fever itself.[44] Later in that week, another Rockefeller Institute scientist was approached by an unnamed Japanese man asking again to be provided with a sample of yellow fever. The scientist was told that he would be paid handsomely. This request was also denied.[45] Many in the American scientific community were confused as to why Japanese scientists would have needed yellow fever, but it was clear that there was something unusual about these requests for a virus that did not originate in or survive well in Asia.[46] American scientists and members of the military community became concerned and wondered about Japan's biological motivations.

Fox's claims that biological warfare was not feasible and was driven by pseudo-science were being questioned by 1941 and Naito's requests for yellow fever bolstered skepticism of the view that biological agents lacked usefulness as weapons. A growing number of intelligence

[43] Lt. Col. Ralph C. Smith to Col. Simmons, "Japanese Attempts To Secure Virulent Strains of Yellow Fever Virus," February 3, 1941, RG 112, Box 11, National Archives at College Park, MD.
[44] Ibid.
[45] Regis, *The Biology of Doom*, 15.
[46] Ibid.

reports, though spotty, compelled United States military officials to wonder why other countries such as Japan, Great Britain, and the Soviet Union had their own programs if biological warfare was not feasible. These developments finally spurred the United States to re-examine its conceptions of biological warfare.

D. Complex Relationships and Evolving Roles: The Military and Scientists' Functions in the American Biological Warfare Program

The American BW Program began slowly and was not meaningfully embraced by many government officials until later in World War II. Scientists and military leaders were key groups who controlled the direction of the American BW Program over the course of World War II. Each group had their own motives and priorities. The first set of actors were scientists. American scientists generally focused upon defensive aspects of biological warfare. Their priorities accordingly concerned saving lives and security, but similar to the Manhattan Project, they were tasked with experimenting with potentially destructive weapons of extreme magnitude. The second set of actors were military leaders. They shared the goal of security but also were concerned with attaining military victory for the United States. The military displayed little initial interest in biological warfare as it failed to show any military promise.

It was not until late 1941 that Secretary of War Henry L. Stimson began the American BW Program by assembling a committee of scientists that would "survey the whole field of biological warfare," titled the WBC Committee. The committee was specifically named "WBC" as to not draw attention to biological weapons, which if abbreviated correctly, would have been the "BWC" or "Biological Warfare Committee."[47] The WBC began a study and issued a

[47] "Notes for Use at 'BWC' Meeting."

preliminary report to Secretary Stimson concluding "that biological warfare might be possible" and recommending that "a permanent civilian organization be established to make a continuing survey in this field and to arrange for research under civilian auspices of such a character as seemed necessary."[48] In 1942, Secretary Stimson wrote directly to President Roosevelt and requested both that funds be allocated toward biological weapons research and that such a civilian agency be created to conduct this research. Stimson's April 29, 1942, letter to Roosevelt urged that: "We must be prepared…And the matter must be handled with great secrecy as well as great vigor."[49] Understanding the consequences of a world war and the much more established biological warfare programs of its enemies, Stimson acknowledged that an American BW Program of some form was necessary and should have the resources to compete in the international sphere. On May 15, 1942, Roosevelt approved Stimson's request, and the American BW Program was formally created.

Stimson named George W. Merck, head of the Merck pharmaceutical company, as the leader of the new War Research Service (WRS). The WRS was a civilian agency led and advised by civilian scientists such as Merck. Stimson believed that staffing the agency this way would "legitimize" the group and any future decisions it would make. To ensure secrecy, the WRS was buried in the Federal Security Agency, a government agency that handled, among other things, Social Security.[50]

The WRS' original work was "exploratory in nature" and focused upon simply learning about the possible methods and toxins with which an enemy could attack the United States.[51] To

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[48] Porter, "Biological Warfare: History, Present Status, Plans for the Future."
[49] Sec. of War Henry L. Stimson to President Franklin D. Roosevelt, April 29, 1942, Franklin D. Roosevelt Library.
[50] Porter, "Biological Warfare: History, Present Status, Plans for the Future."
[51] The Research and Development Board, "Directive: Formation of the Panel on Programs" (Washington, D.C.: Committee on Biological Warfare, January 20, 1948), RG 175, NM84, Box 6, National Archives at College Park, MD.

gain as much information as possible, the WRS enlisted scientists from over twenty-eight American universities to help research biological agents and possible toxins that could be used in warfare. Biologists from universities such as Harvard and Columbia obliged, and all worked on selected individual agents and potential toxins.[52] This was not unusual at the time. Many of the same American universities were tasked with experimenting on and producing chemical weapons in World War I. This procedure was also utilized by the Manhattan Project. Another civilian committee, the ABC, was established by the National Academy of Sciences and the National Research Council to assist and advise the WRS.

The initial goal of the WRS committee was to advise the government on the scientific aspects of biological warfare. Indeed, the WRS was intended to be "a permanent civilian organization…established to make a continuing survey in this field and to arrange for research under civilian auspices."[53] Merck and the WBC created an impressive and collaborative network of scientists at government facilities, universities, and labs across the United States.

Placing the American BW Program under civilian control was considered advantageous by government officials because of its optics. In another letter from Stimson to President Roosevelt requesting him to direct funds toward biological warfare research, he noted that designating biological weapons under a civilian agency would be "perfect cover."[54] At this point in the Program's history, the goal was simply to develop defensive measures against biological warfare from America's enemies that supposedly had been working on biological weapons for a decade.[55] Stimson, perhaps still not fully convinced about the feasibility of biological warfare,

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[52] Guillemin, *Biological Weapons,* 70.
[53] Porter, "Biological Warfare: History, Present Status, Plans for the Future."
[54] Sec. of War Henry L. Stimson to President Franklin D. Roosevelt, May 12, 1944, RG 165, 321-3, National Archives at College Park, MD.
[55] George W. Merck, "Biological Warfare: Report to the Secretary of War by Mr. George W. Merck," January 3, 1946, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.

advised in a 1943 memorandum, that "biological warfare was essentially in civilian hands and only remotely connected with the War Department and thus was made more for the benefit of consulting scientists than for the armed services."[56]

Military officials were content to stay removed from the American BW Program in its early years (1941 and 1942). In fact, many military leaders still believed that employing biological weapons in war was science fiction and mirrored much of the rhetoric that Leon Fox disseminated. For instance, General George C. Marshall, Chief of Staff of the United States Army, and a major leader in the eventual invasion of France, claimed that biological warfare was nothing more than "ghastly business" and Surgeon General Thomas Parran similarly considered research about biological warfare a "horribly dirty business."[57] General William N. Porter described the Program as "an 'unsatisfactory game' because tangible results were 'not so hot.'"[58]

Consistent and encouraging updates from the WRS about its progress and updates on concerning developments in other countries' programs did not change military leaders' reluctance to embrace the American BW Program. For example, on June 15, 1942, the Chinese Military Attaché reported to the United States Joint Chiefs of Staff that Japan had launched a biological warfare strike on China. The Secretary of the Joint Chiefs, Brigadier General W.B. Smith in a short note thanked the Attaché for "the interesting information" and did nothing more.[59]

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[56] "Extraction Paragraph 4a of J.N.W. 11/10 Report," n.d., RG 218, UD 92, Box 19, National Archives at College Park, MD.
[57] Maj. Gen. Thos. T. Handy, "Combined Development of Biological Warfare," April 25, 1944, RG 165, NM84, Box 171, National Archives at College Park, MD; Vice Admiral Ross T. McIntire, "Release of Information on Biological Warfare" (Washington, D.C., October 22, 1945), RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[58] "First Meeting of United States Biological Warfare Committee" (Washington, D.C., November 22, 1944), RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[59] Maj. Gen. Chu Shih-Ming to Brig. Gen. W. B. Smith, June 15, 1942, National Archives at College Park, MD.

The American BW Program continued through 1942 largely in the laboratories of numerous universities and private laboratories. The team of American scientists assembled by the WRS was making incredible and historic discoveries pertaining to biological warfare and science generally. These great successes, coupled with intelligence that the Germans might use biological weapons against the United States, caused the military to reconsider biological warfare.[60] By November 1942, the WRS requested assistance from the Army's Chemical Warfare Service to expand the American BW Program. President Roosevelt approved and construction for the American BW Program's home at Camp Detrick, Maryland began in April 1943 as work on the Program continued.[61] From that point on, Camp Detrick (now known as Fort Detrick) would be the hub for research and development of the American BW Program. While not as famous as the Manhattan Project's Los Alamos Laboratory, historian Leonard Cole confirmed the equivalent security and secrecy present at Camp Detrick to the Los Alamos facility during World War II.[62]

On May 12, 1944, Stimson once again wrote to President Roosevelt about the American BW Program. Stimson acknowledged that "[t]he War Department has been kept thoroughly advised" by the WRS and that its activities reflected "growing military importance." He noted that while "[c]ertain defensive phases" of the WRS's work have been successful, their work had also yielded biological agents that might be used to retaliate against an enemy. As a result of "the greatly increased military nature" of the American BW Program, Stimson reached "the conclusion that the responsibilities for biological warfare should now be unified and centralized within the military establishment."[63] Stimson suggested that Merck be retained in a consulting

[60] Endicott and Hagerman, *The United States and Biological Warfare*, 30.
[61] Sec. of War Henry L. Stimson to President Franklin D. Roosevelt, May 12, 1944.
[62] Cole, *Clouds of Secrecy*, 33.
[63] Sec. of War Stimson to President Roosevelt, May 12, 1944.

role. The President agreed to the new arrangement and funding for, as well as activity in, the American BW Program increased drastically.[64]

The United States government built other facilities across the country to ensure proper testing and experimentation of biological agents and treatments other than the research and production hub at Camp Detrick. Two such installations were the Horn Island proving ground in Mississippi and the Dugway proving ground in Utah. These two proving grounds permitted the Program to test whether its work was effective outside of the cramped, laboratory environment of Camp Detrick. The Vigo Ordnance Plant in Indiana was the last main piece of infrastructure connected to the American BW Program. Already having research and experimentation bases as described above, Vigo was integral in allowing large scale production of the agents developed at Camp Detrick and tested at Horn Island and Dugway. While Vigo was originally constructed to produce conventional weapons in 1942, it quickly transitioned to focus primarily on biological weapons production and would be key if biological weaponry was used during the War.[65]

The American BW Program's leadership became a combination of both the Army and Navy.[66] Both divisions of the United States Armed Services gained much intelligence and pondered ways in which the United States or its soldiers could possibly be attacked by biological weapons. After its transition to the War Department in June 1944, the Program's "staff during the war [became] largely military but certain key civilian scientists were [still] associated."[67] Civilians formerly directing the Program were repurposed as advisors to the Program on

[64] President Franklin D. Roosevelt to Sec. of War Henry Stimson, June 8, 1944, RG 165, 183, National Archives at College Park, MD; George W. Merck, "Biological Warfare: Report to the Secretary of War by Mr. George W. Merck."
[65] Guillemin, *Biological Weapons*, 70.
[66] "Directive: Formation of the Panel on Programs", January 20, 1948.
[67] Ibid.

scientific boards such as the United States Biological War Committee (USBWC). Merck, however, was still a highly respected consultant to the War Department until the end of the War.

It is unclear whether the civilian actors understood how starkly their roles had been limited after June 1944. Many were still contributing to the Program but may not have realized how their authority to influence the Program had changed. Merck himself provided a critical perspective to understand this change. Much of the declassified material is from his perspective and the shifts in power within the Program are evident throughout his correspondence in 1944 and 1945. As 1944 wore on, Merck understood that the military was taking a more direct and controlling interest in the Program to which he devoted much of his time and energy. He understood that the Joint Chiefs' participation in the Program "marked the turning point where the Armed Services began to take major responsibility for b.w. work."[68] He even understood later in 1945 that the Secretary of War was ultimately responsible for the functioning of the Program and that only he, Secretary Stimson, could decide on whether to fill and store biological weapons.[69]

Merck was understandably frustrated at his diminished role in the American BW Program. He was the head of the USBWC and was a main figure that had advocated for the Program and its research and initiatives. Merck's discouragement was evident in a declassified memoranda that he wrote in 1944, a crucial year of growth for the Program. Merck was left out of key discussions surrounding biological warfare intelligence from Great Britain. He complained about the lack of British intelligence that he was receiving on the enemy's biological warfare programs and General William Sarles immediately dismissed Merck and his lack of trust

[68] "First Meeting of United States Biological Warfare Committee."
[69] Lt. Comdr. William B. Sarles, "Meeting of 4 January 1945," January 4, 1945, 4, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.

in Britain. Sarles relayed to Merck that there was "practically nothing" of interest to him.[70] Merck believed that he deserved more respect as head of the USBWC and felt increasingly that he was excluded from key intelligence surrounding biological warfare.[71]

Merck's vexation in 1944 was echoed in many of his dealings with members of the military community, especially Sarles. This frustration extended to the classification of much of the Program's research and information. Sarles appeared to be much more in control of the Program as 1944 wore on and Merck even acknowledged that Sarles could determine which information was designated as classified, top secret, and public. This task had been originally assigned to Merck, and his frustration at the delegation of his civilian power to a member of the military was clear in his rhetoric.[72] Indeed, notes from high-ranking military meetings in the Pentagon indicate the perception that Merck led biological warfare efforts early when "results were not sufficiently definite to warrant consideration by [military] agencies."[73] In 1945, the military concluded, the Program "require[ed] high level decisions" and information should be given to military agencies only, cautioning that the USBWC was not an operating agency and was instead simply for advisory purposes.[74]

Interestingly, there was a consistent push to keep civilians involved, as many high-ranking government officials looked beyond World War II to an American BW Program in the post-war era. Surgeon General Parran acknowledged that attracting civilian scientists to continue the American BW Program was necessary in the future and worried that the military "will not

[70] Comdr. William B. Sarles to Col. W. M. Adams, May 9, 1945, RG 165, NM84, Box 153, National Archives at College Park, MD.
[71] Ibid.
[72] George W. Merck to Lt. Col. W. M. Adams, July 20, 1944, RG 165, NM84, Box 153, National Archives at College Park, MD.
[73] "Notes for Use at 'BWC' Meeting."
[74] Ibid.

have qualified scientists for such work."[75] The successor to the ABC committee, the civilian DEF committee, also found this to be the case as they toured Camp Detrick in 1945 and came to the conclusion that biological warfare research must continue in the post-war period and to make this a reality, civilians needed to be retained.[76]

Civilians did not gain back any of their power over the American BW Program in the post-war period. While this thesis is not focused on the American BW Program in the post-war period, Merck and his colleagues in the scientific community were adamant that much of the data and discoveries by the Program be published for the American public to view and celebrate.[77] Merck was again shut down by those in the military community, who cited concerns over security. By the end of the War, civilian scientists supporting the Program had little influence over Program leaders like Stimson and Sarles and those leaders desired to keep biological weapons available for future conflicts.

The American BW Program began in 1941 with civilians, including civilian scientists, providing the direction for the Program. The other main actor—the military—had little interest in the Program. That changed when the military realized just how far the Program had advanced. Perceiving the opportunity to advance its mission, the military, with the approval of the Commander-in-Chief, assumed authority over the Program in June 1944. Civilians' scientific contributions were thereafter encouraged and valued, but civilian authority over the Program ceased. The significance of this change is crucial. The American BW Program would now be guided by the priorities of the military.

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[75] McIntire, "Release of Information on Biological Warfare."
[76] Chairman O. H. Perry Pepper M.D., "Summary of 12-13 June 1945 Meeting of the DEF Committee," June 12, 1945, 12–13, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[77] Merck, "Final Report to the U.S.B.W. Committee."

III. Defensive Aspirations and Offensive Successes: The American Biological Warfare Program's Capabilities During the War

The American BW Program began after many in the American scientific community agreed that biological warfare was not only possible, but also was a threat from potential enemies. Scientists from across the United States provided the intellectual muscle initially to develop possible defenses against biological weaponry. The civilian efforts to combat biological toxins deployed against military and civilian targets quickly yielded positive results. But to execute this priority effectively, it became clear that scientists needed to create biological warfare weaponry in order to develop defenses to biological toxins. Hence, scientists as well as those in the military realized that it was nearly impossible to divorce defensive and offensive biological weapons research.

In June 1944, the military observed the efficacy of the offensive weapons created by the scientists and assumed responsibility over the American BW Program. The result of this change in authority was that the Program shifted its research to both defensive and offensive biological weapons. This section asserts that the Program not only researched offensive biological weapons, but also produced such weapons by the end of the War. It buttresses this argument with evidence that multiple types of biological weapons, containing agents such as botulinus and anthrax as well as crop destroying toxins, were tested rigorously and were available for the United States to use against its enemies. By the time the War was in its final stages in 1945, the United States created numerous vaccines and immunizations to defend against biological weapons and developed its own offensive biological arsenal.

A. Early Biological Warfare Research and Initial Defensive Focus

The American BW Program began with scientists reacting to the potential that the United States' enemies had biological warfare capability and could use it against Allied troops or even the United States itself. The Program's scientists were squarely focused upon defensive measures against biological weapons at the outset of the Program. The scientists were especially concerned about the perceived German superiority in offensive biological weapons that was reported by the intelligence community (that was later proved false).[78]

Research into biological agents followed a standard scientific process—and on a scale never before executed.[79] Biological agents "were made as virulent as possible, produced in specially selected culture media under optimum conditions for growth, and tested for disease producing power."[80] American scientists then conducted comprehensive investigations focusing upon stability, lifespan, necessary storage conditions, and incubation periods. And, of course, these scientists subjected these pathogens to disease-fighting compounds such as antibiotics and toxoids to determine prevention and treatment effectiveness.[81]

The most virulent pathogens were thoroughly studied by the top expert in that pathogen in the United States.[82] As discussed earlier, these experts were scientists at leading universities and private laboratories. Prestigious institutions such as Harvard, Notre Dame, and Stanford were just a few of these universities that participated and gained direct funding from the War Research Service.[83] For instance, the University of Kansas' Dr. Cora Downs researched the Pasteurella tularense bacteria and attempted to give humans immunity against it. Other similar

[78] "Collection of Intelligence Indicating Enemy Use of X," December 16, 1943, RG 165, NM84, Box 153, National Archives at College Park, MD.
[79] Merck, "Final Report to the U.S.B.W. Committee."
[80] Merck, "Biological Warfare."
[81] Merck, "Final Report to the U.S.B.W. Committee."
[82] Merck, "Biological Warfare."
[83] Bernstein, "The Birth of the U.S. Biological Warfare Program," 116.

projects at American universities aimed to produce immunity to fowl plague and Newcastle disease against poultry. The United States Department of Agriculture (USDA) was also heavily involved in this defensive research. The USDA not only spearheaded much of the defensive research taken on by university scientists, but also conducted valuable research on fungal diseases.[84] Research was conducted on both plants and animals.[85]

Along with focused biological research regarding potential toxoids and vaccines, the American BW Program endeavored to create tactics and measures such as masks and other personal protective equipment to prevent mass casualties on the battlefield due to biological weapons. Scientists at Camp Detrick (and eventually top military leaders including Secretary of War Stimson) were determined, as a result, to teach lower-level officers about biological warfare.[86] Unsurprisingly, many American soldiers and military leaders were not cognizant that there was a biological warfare threat or even understood the notion of biological warfare. This lack of prior information allowed American military strategists to keep valuable information about the American BW Program and biological warfare generally unknown to many lower-ranking soldiers (as well as the public more generally). However, the fact that large swaths of the military had no baseline knowledge about this type of warfare would make training against biological warfare even more difficult.[87]

Scientists gave military leaders on the ground information about both potential biological weapons and how these weapons could be used and disseminated. The most common form of

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[84] Sec. of War, "Biological Warfare: Memorandum for the Chief of Staff," January 13, 1944, RG 164, NM-84 Box 172, National Archives at College Park, MD.
[85] Merck, "Biological Warfare."
[86] Cap. J. M. Creighton and Col. J. K. Cockrell, "Classification of the Subject Biological Warfare," April 5, 1944, RG 165, NM 84 Box 171, National Archives at College Park, MD; Sec. of War, "Biological Warfare: Memorandum for the Chief of Staff."
[87] Col. O. L. Nelson, "Protection Against Bacteriological Warfare," January 6, 1944, RG 165, NM84, Box 171, National Archives at College Park, MD.

dissemination of biological warfare information was through specially curated training manuals given to generals and other, high-ranking military leaders. Program scientists, with the assistance of military strategists, prepared these manuals to educate those in the European and Pacific theaters without disclosing too much about the Program's then-current research. One such manual was titled "Instruction for Defense Against Biological Attack" and outlined the ways in which a biological attack could take place and under what circumstances. While strategic education was far from the preferred method of large-scale protection against biological weapons, many in the Program urged that training programs conducted by the Chemical Warfare Service at Camp Detrick (and other forms of education) be held in case of a possible biological attack.[88]

This defensive focus extended to the home front as well. Biological warfare was a real threat to the continental United States, even if America's enemies were thousands of miles away in Europe and Asia. An attack on the American home front was a real and constant concern for those within the Program, scientists and military officials alike, as biological weapons could theoretically be disseminated by small groups of foreign enemies in covert ways. These fears became more explicit when empty Japanese balloons were found in the western United States, prompting an even more comprehensive defensive policy at home.[89] This culminated in a policy of ABW (or anti-biological warfare) across American cities and towns, conducted by military leaders in the Program. This ABW policy aimed to protect those in the continental United States from having their water supplies tampered with as well as protecting other foods and drinks (such as milk). The creators of the ABW policy were also concerned about the products of vital

[88] Ibid.
[89] Lt. Col. William R. Maull, "Preparedness for Defense Against BW," June 23, 1945, RG 160, NM-25 12, Box 77A, National Archives at College Park, MD.

industries, such as the pharmaceutical industry, which manufactured drugs and other biological products.[90] Some of these same measures were implemented in military installations abroad and extended to practices by those on the front lines of the War, especially in Asia.

B. Defensive Biological Weapons Successes and Limitations

The results of defensive efforts by the American BW Program were nothing short of remarkable. For instance, by the start of 1944, scientists in the Program had already invented a toxoid to prevent what the military called "X" (botulinus toxin) and an antitoxin that could treat X after exposure.[91] Camp Detrick produced enough X toxoid for 700,000 people by April 1944 and by November 1944, enough X toxoid was sent to Europe to inoculate one million people.[92] Medications were also developed to treat exposure to anthrax, glanders, and melioidosis.[93] These breakthroughs were significant in several ways, including that the United States was the only country to have these defensive capabilities, which was confirmed through blood tests taken of captured enemy soldiers.

Great strides were also made in developing air masks and filters, biological detection methods, invention of protective clothing, and decontamination equipment.[94] The military ordered over one million of the newly developed filters and masks by February 1944.[95] The military also ordered thousands of tons of decontaminating bleaching powder that the Program

[90] Sec. of War, "Biological Warfare: Memorandum for the Chief of Staff."
[91] "Defensive Measures Against Bacteriological Warfare," May 25, 1944, RG 218, UD 92, Box 1, National Archives at College Park, MD.
[92] "First Meeting of United States Biological Warfare Committee"; Brig. Gen. R. C. Ditto, "Progress on B. W. Counter-Measures," February 24, 1944, RG 621, NM-84, Box 171, National Archives at College Park, MD.
[93] Lt. Comdr. William B. Sarles, "Camp Detrick Meeting," January 2, 1945, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[94] Nelson, "Protection Against Bacteriological Warfare"; Sarles, "Camp Detrick Meeting."
[95] Brig. Gen. R. C. Ditto, "Progress on B. W. Counter-Measures."

developed for various regions in the United States.[96] Indeed, a military shipping order form dated May 18, 1945 reveals that a military facility at 39 Whitehall Street in Manhattan was to receive 4,000 pounds of bleaching powder, as well as seven masks, ten ointment kits, two decontamination kits, and two decontamination brushes.[97]

Scientists within the American BW Program realized, however, that it would be very difficult to defend all soldiers, much less all civilians from a biological attack, notwithstanding the advances they had achieved. It was true that toxoids and inoculations had been developed for biological weapons like botulinus, but the developmental process also permitted scientists to begin to understand why this type of warfare was so dangerous and powerful. Physical means such as protective clothing and gas masks were the most reliable and suitable defenses against biological weapons, but even these means would only be useful if one knew an attack was coming and could prepare accordingly. In most cases, the utilization of biological warfare would be incredibly difficult to identify and could have already spread rapidly and inflicted massive damages before officials even realized toxins had been released. As a result, Program scientists and the military were acutely aware of the limitations on defensive measures to biological weapons that had been developed.

C. Offensive and Defensive Biological Weapons Research: Intertwined Disciplines

The United States had a policy through much of World War II that it would not use or produce offensive biological weapons.[98] This seemed consistent with what Merck believed was

[96] "Defense Against Bacteriological Agents Introduced by Japanese Balloons," n.d., RG 160, NM-25 12, Box 77A, National Archives at College Park, MD.
[97] Col. T. H. Murphy, "The Special Decontamination Allowance," May 24, 1945, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[98] Maj. Gen. Myron C. Cramer, "Destruction of Crops by Chemicals" (Washington, D.C., March 5, 1945), RG 160, NM-25 12, Box 77, National Archives at College Park, MD.

the "main objective" of the American BW Program: "to develop methods of defending ourselves against possible enemy use of biological warfare agents."[99] But this United States policy regarding offensive biological weapons was eventually re-examined and abandoned—reluctantly by scientists and eagerly by military officials.

The determinative factor in this change was the difficulty in separating defensive biological weapons research from offensive biological weapons research. Merck, for instance, was forced to concede that "the problems of offense and defense were closely interlinked in all the investigations conducted."[100] This meant that to advance the cause of defending against enemy biological weapons, offensive biological weapons would have to be studied and developed. Indeed, Merck soberly agreed in a letter dated May 16, 1945 that "development of defensive measures against BW necessitate[d] thorough knowledge and investigation of offensive possibilities."[101]

Scientists bristled at the implications of this reality as they foresaw a future where the military would have access to offensive biological weapons. Secretary of War Stimson and other military leaders had already secretly begun to focus upon development of offensive biological weapons. This was evident in Stimson's May 12, 1944 confidential letter to President Roosevelt, where Stimson excitedly advised about "biological agents particularly adapted to military uses…[for] possible retaliation."[102] The President's shift in American BW Program authority from civilians to the military thereafter was largely driven by this new focus on offensive biological weapons, meaning that the prior policy against use or production of offensive weapons

[99] George W. Merck to Sec. Of War Robert P. Patterson, October 24, 1945, RG 164, NM-84 18, National Archives at College Park, MD.
[100] Merck, "Final Report to the U.S.B.W. Committee.".
[101] George W. Merck, "Summary and Estimate of Enemy Intentions and Capabilities in Biological Warfare," May 16, 1945, RG 165, NM84, Box 153, National Archives at College Park, MD.
[102] Sec. of War Henry L. Stimson to President Franklin D. Roosevelt, May 12, 1944.

was abolished. The military, perhaps to placate the scientists contributing to the Program, continued to embrace the rationale of the connectedness between defensive and offensive research to justify the Program's offensive weapons expansion. As a matter of fact, Stimson relied upon this justification a month after the War had ended to advocate continuation of the Program, pointing out that it was "advisable to continue research and development…of biological warfare including such knowledge of offensive possibilities as may be necessary to prepare adequate defensive possibilities."[103] Scientists and the military alike understood the close connection between development of offensive and defensive biological warfare measures, but their objectives and vision for the direction of the Program differed markedly.[104]

D. Offensive Weapons Breakthrough with Dangerous Toxins

When the military assumed control of the Program in June 1944, an emphasis on offensive biological warfare measures became a priority. In fact, this new commitment to developing offensive capabilities progressed to a point where American officials were worried that defensive research would hold back researchers from perfecting offensive weapons, a complete reversal of the original goal of developing defenses against other countries' then-superior biological weapons.[105] But consistent with its prior skepticism, military officials remained concerned about how to deploy biological agents.

One of the first toxins that the American BW Program discovered could be useful as an offensive biological toxin was anthrax. Anthrax is a highly toxic bacterial disease that can be contracted through cuts in one's skin or through digestive and respiratory systems. In terms of

[103] Merck, "Final Report to the U.S.B.W. Committee."
[104] Endicott and Hagerman, *The United States and Biological Warfare,* 28.
[105] "Directive: Formation of The Panel on Program", January 20, 1948.

disseminating it for offensive purposes, the Program discovered that anthrax could be released in dust or liquid form from the air.[106] This made anthrax very useful and very versatile. There was little defense against anthrax, though it could be defended against through protective clothing and masks. Eventually, a toxoid against anthrax was created and produced, but it was not as effective as many in the Program would have liked. Thus, if anthrax was used in a military setting, some soldiers could have been protected if they were immunized or were given proper protective equipment. However, such measures were simply not feasible as a defense for civilian populations.[107]

Along with the incomplete defenses against anthrax, researchers were concerned about anthrax's potential to spread. While Program scientists represented that the use of anthrax offensively "will not set up an epidemic and therefore presents no such danger to the side employing it," some were worried that heavy winds could spread the toxin. For example, scientists conceded that anthrax was "subject to air currents and may be blown for considerable distances. It has been shown, for example, that animals accidentally exposed 12 miles from the point of explosion of one four-pound bomb have contracted anthrax."[108] Anthrax ultimately was considered desirable because it was extremely poisonous and the United States already "ha[d] the means of producing this in large quantities."[109] American officials were also confident that German and Japanese soldiers had not been inoculated against anthrax, further making it an attractive offensive option.

Another breakthrough was made with the botulinus toxin. Similar to anthrax, botulinus could be contracted through bodily cuts or by ingestion in the digestive or respiratory systems.

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[106] "Probable Biological Agents Which May Be Employed by the Enemy."
[107] Ibid.
[108] Ibid.
[109] Ibid.

The toxicity of botulinus was the same regardless of how a person contracted it. Personal protective measures were crucial defenses against this toxin, and new masks that could filter out dangerous particles were specifically developed and produced for defense against botulinus.[110] Like anthrax, botulinus toxin could be deployed by the air as a powder or liquid.[111] Botulinus toxin was unique in that a toxoid was developed that could provide immunity to those who received it. Unfortunately, this immunity would need to be developed over several months and required numerous immunizations. Also, there were at least five different types of botulinus toxin, so the United States could only immunize their troops effectively against certain strains. Two specific strains were especially potent, and the United States aimed their defensive measures on protecting against those specifically.[112]

American scientists were impressed with botulinus' high stability and the fact that it could be easily stored (allowing it to be utilized in distant parts of the world). It was also far more lethal than any chemical used in World War I. The British were very successful in their botulinus research. Specifically, the British saw botulinus as the preferred offensive biological weapon while the American BW Program was much more focused on anthrax.[113]

Numerous other toxins were researched and considered for offensive biological warfare. These included tularemia, brucellosis, plague, glanders, Rift Valley fever, yellow fever, typhus, psittacosis, and dengue fever. While these toxins were all dangerous, a crucial downside to these toxins was the possibility that they could cause epidemics. As one American scientist recognized, "[m]any of these agents are transmissible from man to man and might start a large-

[110] Nelson, "Protection Against Bacteriological Warfare."
[111] "Probable Biological Agents Which May Be Employed by the Enemy."
[112] Ibid.
[113] "First Meeting of United States Biological Warfare Committee."

scale epidemic," something that the United States greatly feared.[114] Other factors militating against development of these toxins for possible offensive weaponry were their lack of stability and difficulty to produce. Further, it would have been much more difficult to disseminate these toxins in comparison to anthrax and botulinus, which were both very versatile.

The American BW Program ultimately prioritized offensive biological "agents that exhibit[ed] the best large scale possibilities," and anthrax and botulinus toxin fit the bill.[115] Both of these toxins were researched and tested and by 1944, American officials were confident that they could be used offensively.[116] As was observed in a New Developments Division report about potential biological weapons that could be used on January 1, 1944, "[t]hese two agents [anthrax and botulinus toxin] have graduated in our country from the stage of laboratory experiments and are well off into the pilot plant stage, and the time is now short before it will be possible, if necessary, to put these in large production."[117] The United States was thus able to begin large-scale production of these agents that were highly toxic to humans and animals.

E. Crop Destruction: A New (and Preferred) Form of Biological Warfare

Running parallel to research and development of anthrax and botulinus toxin for offensive weaponry were new crop destroying toxins. This form of biological warfare was new to many American scientists and military officials who viewed these toxins as a preferable alternative to biological weapons that would cause direct harm to humans and animals. Crop destroying toxins could cripple a country and its food supplies, achieving military objectives in a

[114] "Probable Biological Agents Which May Be Employed by the Enemy."
[115] Ibid.
[116] Porter, "Biological Warfare: History, Present Status, Plans for the Future."
[117] "Probable Biological Agents Which May Be Employed by the Enemy."

different way.[118] This consideration would become particularly critical in American policymakers' decision-making, as they believed that harming crops was quite different and permissible in comparison to biological agents that directly harmed humans and animals.

American scientists conducted intensive experimentation on crop destroying toxins. One goal of these experiments was "to determine the feasibility of accomplishing severe injury or destruction of [] food crops by the application of growth-inhibiting (LN) compounds in static trials."[119] While some crops were not susceptible to toxins, there was a vast array of crops that could be severely damaged by these toxins, especially in tropical areas.[120] There were repeated successful experiments and field tests on crop destroying toxins, but scientists were still uncertain about the extent of the effects of these toxins on both soil and water. Scientists were concerned that these toxins could spread into local water reserves and harm local residents.[121] As a result, scientists within the American BW Program believed that if these weapons were to be used, they would need to be deployed with great precision. Even then, there would still be uncertainty as to just how lethal and widespread the effects would be.

American policymakers warmed to the idea of offensive biological warfare against crops, citing the fact that massive crop destruction was not new in world history. For instance, William Diehl, a member of the United States Air Force, pointed to well-known instances such as the potato famine in Ireland and the chestnut blight in the United States.[122] These botanical destructions "caus[ed] major economic derangements" and affected the morale of those

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[118] Edmund B. Lambert to Admiral William D. Leahy, "Confidential Memorandum," Memorandum, August 4, 1942, RG 218, UD 92, Box 19, National Archives at College Park, MD.
[119] Chemical Defense Research Establishment, "Destruction of Tropical Crops with Growth-Inhibiting Agents (Special Report #64)" (South India, May 1945), RG 175, NM84, Box 3, National Archives at College Park, MD.
[120] Ibid.
[121] "Crop Destruction by Chemical Agents (Special Report #79)," n.d., RG 175, NM84, National Archives at College Park, MD.
[122] William W. Diehl to Admiral William D. Leahy, "(N-37) Confidential Memorandum," Memorandum, August 4, 1942.

countries. The potential of crop-destroying offensive warfare excited many in the American military, as it did not involve the harming of humans or animals (again, not in a direct sense like anthrax or botulinus toxin).

The Department of Agriculture was central to many of the American BW Program's defensive efforts of biological warfare, but it was purposely left out of offensive research and development. The Department's mission was to advance science to preserve crops, and the destruction of crops was thus antithetical to this purpose. Edmund Lambert of the United States Air Force wrote:

> Perhaps the time is at hand when, as in chemistry, physics, and engineering, it is practicable and also necessary to reverse the constructive role of these sciences and employ biological agents to destroy the materials upon which the enemy depends for making war. It should be emphasized that none of the biological agents contemplated for this purpose affect the health of man or animals.[123]

Other Government officials feared that the Department of Agriculture's complicity in this offensive research and development would taint its international reputation forever because it "participate[d] in a[] program of the purposeful spread of plant pests."[124]

A major advantage of these crop destroying toxins was their availability and cheap price. Numerous scientists noted how the United States already had large quantities of these crop destroying toxins and could thus manufacture offensive weaponry of this kind easily. Additionally, using this type of biological warfare would be much cheaper as compared to more expensive toxins such as anthrax.[125] Diehl and Lambert even believed that the United States

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[123] Lambert to Leahy, "Confidential Memorandum,", August 4, 1942.
[124] Ibid.
[125] William W. Diehl, Edmund B. Lambert, and Freeman Weiss, "Plan for a 3-Way Attack by Biological Agents on the Sugar Beet Crop of Axis Nations in Europe in 1943," August 5, 1942, RG 218, UD 92, Box 19, National Archives at College Park, MD.

could stop the spread of these crop destroying toxins in the post-war period, which was wishful thinking as these toxins could spread quite easily and quickly.[126]

F. Affirmation of American Capability: Large Scale Production of Offensive Biological Weapons

Correspondence amongst those in the Program and military officials by 1944 demonstrate an understanding that biological agents such as anthrax, botulinus, and crop destroying toxins were viable offensive biological weapons. The next step in developing this aspect of the American BW Program was producing these materials and weapons in the event they would be deployed. As discussed earlier, the American BW Program had its main production center in Indiana at the Vigo Ordnance Plant. The Vigo plant was utilized for both the large-scale production of botulinus toxin and the toxoids to combat this toxin. Mass production of biological weapons at Vigo started after the plant's transition away from conventional weapons in 1942 and it quickly became a crucial production facility for the Program.[127] Astonishingly, at the height of its production in 1945, the Vigo Plant produced enough botulinus (and eventually anthrax) to fill 500,000 bombs per month.[128]

The production of offensive and defensive biological weapons was taking place at locations other than Vigo. Camp Detrick, for instance, briefly doubled as a production facility.[129] Biological weapons were also being mass produced in private pharmaceutical plants. One such plant was the Dow Chemical Company plant in Michigan. The United States contracted with Dow Chemical to produce 500 pounds of 2-4 dichlorophenoxyacetic acid per day, a toxin that

[126] Ibid.
[127] Guillemin, *Biological Weapons*, 69.
[128] "First Meeting of United States Biological Warfare Committee."
[129] Porter, "Biological Warfare: History, Present Status, Plans for the Future.".

would cause uncontrolled growth of weeds and other plants leading to death.[130] It was becoming clear that the American BW Program had not only succeeded in researching and developing biological weapons for offensive use, but also it actively produced significant quantities of these weapons on a large scale. This evidence confirms that the United States developed and possessed operational offensive biological weapons during World War II.

G. Conclusion

After a matter of only several years, the American BW Program had made immense progress in biological weapons research. The Program was formed and discovered ways to defend United States soldiers and civilians against biological warfare and learned that it would be difficult in many cases to stop a biological warfare attack without prior knowledge of it. The United States then—under the control of the military—focused much of its attention on offensive biological weapons research. In this aspect of biological warfare research, the Program was highly successful and showed much promise. In the last year of World War II, the United States had offensive biological weapons capability with agents such as anthrax, botulinus toxin, and crop destroying toxins produced and ready for deployment. The next logical question is clear: did the United States military plan to use these offensive biological weapons during the War?

[130] Comdr. William B. Sarles, "Report of Meeting" (Washington, D.C., March 9, 1945), RG 160, NM-25 12, Box 77, National Archives at College Park, MD.

IV. Planning an Offensive Biological Warfare Attack Against Germany, Japan, or Both?

By late 1944, the American BW Program had progressed well beyond expectations and by early 1945, operational biological weapons were being produced in high volumes. Three biological agents—anthrax, botulinus toxin, and crop destroying toxins—were considered the most viable for offensive use following extensive research and development. But were there plans to deploy these biological weapons during World War II?

This section advances the argument that the United States military formulated plans to use its newly developed biological weapons against its enemies during World War II in 1945. Declassified documents reveal that military leaders considered strategic and moral factors and even legal prohibitions when contemplating use of biological weapons. Further, declassified documents demonstrate that military leaders prepared example plans for offensive biological warfare in both the European and Pacific theaters during World War II. The most advanced planning involved the use of crop destroying toxins in the Pacific theater to compromise Japan's food supply and the food supply on Pacific islands controlled by the Japanese. This section concludes with the claim that the United States was prepared to use biological weapons and had the War not ended, the United States would have, at a minimum, deployed crop destroying toxins in the Pacific theater.

A. United States Considerations Underlying Offensive Biological Warfare Use

Informal United States policy until April 1944 dictated that it would only consider using biological weapons as a retaliatory measure. In fact, an internal proposal was drafted for possible public dissemination that would explicitly provide: "The United States does not intend to use

biological weapons unless forced to do so in retaliation by reason of its use by the enemy."[131] But with a highly successful and operational offensive biological weapons program soon to be at their disposal, the Joint Chiefs of Staff balked in April 1944. Their concern was not to "bind ourselves" to retaliatory use only.[132] As a result, no offensive biological weapons policy was ever promulgated during World War II, leaving open the possibility of first use by the United States.

The advantages of offensive biological weapons were attractive to military leaders. Unlike use of conventional bombs against human populations, the benefits of offensive biological warfare included preservation of ports, communications outposts, factories, and other assets. Such structures could be subsequently inhabited and used by United States personnel.[133] In addition, United States troops would be subject to far less danger if biological warfare was employed. The military believed that biological agents could be deployed surreptitiously, allowing United States troops to exit quickly. Biological agents only later would be detected and the harm to the enemy would only be realized when United States troops returned safely to Allied outposts.[134] Further, the costs associated with offensive biological warfare were low, especially when considering the damage caused by atomic weapons and the casualties that would be incurred during a full-scale invasion.[135]

Moral factors were also considered in favor of employing offensive biological warfare. These concerns were summarized by the Surgeon General in 1945. He posited that causing the enemy to be ill or die from disease was more humane than, for instance, destroying their bodies

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[131] Maj. Gen. S. G. Henry to Chief of Staff, "Biological Warfare," April 10, 1944, RG 218, UD 92 Box 1, National Archives at College Park, MD.
[132] Ibid.
[133] O.C. Woolpert, "Talk by Dr. O.C. Woolpert" (June 10, 1946), RG 160, NM-25 12, Box 77A, National Archives at College Park, MD.
[134] W.R.S. to Colonel B. L. Lucas, "Memorandum," February 18, 1944, RG 218, UD 92, National Archives at College Park, MD.
[135] Merck, "Final Report to the U.S.B.W. Committee."

with bombs or shrapnel or burning them alive with flame throwers.[136] Further, he noted that "[d]estroying [the enemy's] domestic animals and crops on his farms by biological attack" is far more humane than blockading food by sinking ships and killing sailors.[137]

There were certainly countervailing considerations to the use of offensive biological warfare. For instance, United States military leaders worried that their enemies in World War II might retaliate against the United States and its troops if those enemies learned the United States employed offensive biological weapons. One declassified letter, for instance, noted that "it must be emphasized that (sic) German scientists had almost a ten years' start before" the American BW Program began and that "[i]t is safe to assume" that Germans have quantities of biological weapons. However, by 1944, intelligence about enemy biological weapons development was acknowledged by the military to be "meager."[138] Intelligence sources eventually determined that Germany had no offensive biological warfare capability, and in a surprising detail to those in the American BW Program, biological warfare was forbidden by Hitler himself.[139] This was confirmed in later intelligence, as Germany's director of biological warfare claimed that any work on biological weapons was defensive in nature and was limited.[140]

Japan's retaliatory capabilities were also considered by United States military leaders. As discussed above, Ryoichi Naito and another Japanese scientist attempted to buy yellow fever from the Rockefeller Institute in 1941. There were also rumors that the Japanese experimented and used biological weapons against the Chinese both during and after their conquests in

[136] McIntire, "Release of Information on Biological Warfare," October 22, 1945.
[137] Ibid.
[138] "Probable Biological Agents Which May Be Employed by the Enemy," January 1, 1944.
[139] Lt. Col. Howard I. Cole, "Periodic Intelligence Report No. 9," April 16, 1945, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[140] Merck, "Summary and Estimate of Enemy Intentions," May 16, 1945.

China.[141] Thus, many in the intelligence community, like Director of Information and Intelligence of the WRS. John P. Marquand, considered Japan, not Germany, to be the most likely to use biological weapons during the War.[142] Japan had allegedly used biological weapons before and intelligence pointed to the country's preparedness on defensive and offensive means of biological warfare, such as a rumored bacillus bomb.[143] The United States, however, was satisfied by 1945 that the Japanese had a largely undeveloped biological warfare program.[144] Accordingly, the risk of retaliation by the United States' enemies in World War II seemed highly unlikely.

Another countervailing concern for United States decision makers in use of offensive biological weapons was the risk of causing an epidemic. Particularly earlier in the War, scientists warned that many of the biological agents they were researching were unstable. In particular, American scientists worried that these agents were "transmissible from man to man and might start a large scale epidemic."[145] Biological agents by early 1944 were carefully identified as to whether they might cause epidemics.[146] Moreover, by November 1944, the military formulated a "policy not to use agents which might cause epidemics."[147] But as the United States' offensive biological weapon capability developed, several biological agents such as anthrax and botulinus toxin were recognized by scientists as stable, controllable, and deadly.[148] As one declassified

[141] John P. Marquand to Col. B. L. Lucas, "Memorandum," February 21, 1944, RG 218, UD 92, National Archives at College Park, MD.
[142] Ibid.
[143] Merck, "Summary and Estimate of Enemy Intentions and Capabilities in Biological Warfare."
[144] Merck, "Biological Warfare: Report to the Secretary of War."
[145] "Probable Biological Agents Which May Be Employed by the Enemy."
[146] W.R.S., "Memorandum," February 18, 1944.
[147] "First Meeting of United States Biological Warfare Committee."
[148] "Probable Biological Agents Which May Be Employed by the Enemy."

letter acknowledged, anthrax developed for offensive use was highly stable, easy to store, lethal, and "will not set up an epidemic."[149]

The military also considered the legality of employing offensive biological warfare. Military legal advisors opined in March 1945 that "[t]he United States is not bound by any treaty" prohibiting the use of biological weapons.[150] Although military attorneys acknowledged the Geneva Protocol of 1925, they were quick to note that the United States never ratified that treaty.[151] The opinion finally noted that even if international law prohibited using biological weapons to injure humans, there was no impediment to destroying crops and other plants.[152]

United States political and military leaders considered various factors implicated by the use of offensive biological weapons against the Axis powers and none were considered prohibitive. This supports the conclusion that United States leaders were comfortable with the use of such weapons. Moreover, the United States' production of massive quantities of agents that could be dispersed by bombs against humans, animals, and plants is strong evidence that the United States was planning to employ offensive biological warfare. As discussed earlier, by the start of 1945, the United States began filling orders for one million four-pound anthrax bombs at its Vigo plant.[153] The United States had the capability at that time to produce 500,000 anthrax or bacillus bombs per month.[154] In addition, the crop-destroying agent named "LN-8" was being produced by Dow Chemical at a rate of 500 pounds per day, and the military ordered 25,000 pounds of that agent.[155] This evidence is strengthened by the fact that the development and production of these biological weapons were conducted in secret, so deterrence of the enemy was

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[149] Ibid.
[150] Cramer, "Destruction of Crops by Chemicals, March 5, 1945.
[151] Ibid.
[152] Ibid.
[153] "First Meeting of United States Biological Warfare Committee."
[154] Ibid.
[155] William B. Sarles, "Report of Meeting (3/9/1945)".

not a consideration. Production of offensive biological materials at this high rate and the perceived lack of moral, strategic, and legal impediments indicates that the United States was planning to wage offensive biological warfare.

B. Plans to Use Biological Weapons Against Germany

In response to intelligence about possible German biological aggression and alleged superiority, the United States prepared for a counterattack against the Germans. The original plan for retaliation against a German biological warfare attack prior to 1942 revolved around the United States' use of gas given that its biological warfare knowledge and research were not advanced enough to attack with biological weapons.[156] By mid-1942, three Department of Agriculture scientists proposed a new biological warfare plan to use crop destroying "diseases and insect pests" to cripple the agriculture of the Axis countries. The sugar beet crop was singled out by these scientists as a plant that would be advantageous to destroy. Sugar beet was used for powder, fuel, and rubber and would cripple the war making of Germany and Italy.[157] There were also suggestions by the British to use botulinus toxin in Germany or the German islands in the Baltic Sea.[158]

Declassified example plans from April 1944 vividly demonstrate the United States military's intentions regarding offensive use of biological warfare against Germany. For instance, the military determined the volume of biological agents that would be necessary to wage a biological attack on Stuttgart, Germany—approximately 1,987 clustered projectiles filled

[156] "Biological Warfare: Report by the Joint Staff Planners," n.d., RG 218, UD 92 Box 1, National Archives at College Park, MD.
[157] William W. Diehl, Edmund B. Lambert, and Freeman Weiss to Admiral William D. Leahy, "Confidential Memorandum," August 4, 1942, RG 218, UD 92, Box 19, National Archives at College Park, MD.
[158] Sarles, "Report of Meeting, 28 December 1944".

with 500 pounds of anthrax. It also highlighted the optimal conditions for such a strike: daylight with no rain and light to moderate winds. The military observed that such an attack would "kill a considerable number of people."[159] Further, this plan acknowledged that such an attack in Europe might be objectionable to the world community. In contrast, the same report noted that biological warfare is "adapted for attacks on islands, the occupation of which is unnecessary."[160]

But as 1945 arrived, the War in Europe was coming to a close. This important circumstance, coupled with disadvantages such as the dangers associated with biological warfare and the possibility of world disapproval, led the military to abandon plans to launch a biological warfare campaign in Europe.[161] But, as will be demonstrated below, the Pacific theater presented more compelling circumstances to employ offensive biological weapons.

C. Plans to Use Biological Weapons Against Japan

Employment of biological weapons against Japan was much more plausible and realistic than it was against Germany. This was the case for two important reasons. First, the United States and its allies were still in a contested war with Japan in 1945 when the United States was ready to deploy offensive biological weapons. Germany had essentially lost the War by 1945 and, in fact, surrendered in early May 1945. The focus was thus upon Japan by 1945. Second, Japan had given every indication that it would fight to the last soldier, as demonstrated by the kamikazes. The military indeed acknowledged that the War against Japan would likely have to be won "yard by yard," resulting in high troop casualties.[162] Historians attribute this rationale to

[159] "Appreciation of the Value of the 4-1b, H.E. /Chem Bomb Type F, Charged N," April 21, 1944, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.
[160] Ibid.
[161] Diehl, Lambert, and Weiss, "Confidential Memorandum," August 4, 1942.
[162] Maj. George Fielding Eliot, "Gas Against the Japanese," *Evening Star*, June 6, 1945, RG 160, NM-25 12, Box 77A, National Archives at College Park, MD.

the deployment of atomic weapons at the end of the War, but this was also a rationale driving the potential dissemination of biological toxins.[163]

The evidence compels the conclusion that the United States planned to use offensive weapons against Japanese crops near the end of the War in 1945.[164] The plan had two targets: Japanese-controlled islands and the Japanese mainland. General William N. Porter was specifically integral in the push to use biological weaponry to end the War, claiming that biological weapons were a "weapon of warfare" and, in particular, that they "might be a valuable tool in the mopping up of Japanese-held, by-passed islands."[165] General Wilhelm D. Styer agreed, expressing his belief "that by-passed islands occupied by the Japanese and isolated from friendly territory" would constitute appropriate targets.[166] A consistent theme of the biological warfare planning was destroying "Japanese gardens" to stifle the country's food supply.[167]

Careful research was conducted to construct the United States' plan. For instance, the military identified the types of crops grown in the targeted regions, the farming acreages, the local climates, and the growing seasons of the crops.[168] The military determined that Japan's rice (which it estimated to be sixty-percent of the Japanese diet) was grown almost exclusively in particular farming regions in mainland Japan.[169] The military also determined the types of crops grown on the occupied islands (including sweet potatoes, coconuts, and tapioca) and the open

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[163] Eliot, "Gas Against the Japanese."
[164] An observer may question whether racism against Asians was a major factor motivating the United States' plan to launch biological weapons against Japan. A close examination of declassified documents pertaining to the plan reveals no such explicit discriminatory intent.
[165] "First Meeting of United States Biological Warfare Committee."
[166] Sarles, "Report of Meeting, 28 December 1944."
[167] "Japanese Gardens in the Southwest Pacific Theater," n.d., RG 160, NM-25 12, Box 77, National Archives at College Park, MD; "Summary Status of Biological Warfare," November 24, 1944, National Archives at College Park, MD.
[168] William B. Sarles, "Meeting of January 4, 1945," January 4, 1945.
[169] Lt. Comdr. William B. Sarles, 4; Maj. Gen. William N. Porter to Commanding General, Army Services Forces, "Military Requirement for Crop Destruction in Japan," March 31, 1945, RG 160, NM-25 12, Box 77, National Archives at College Park, MD.

farming land on individual islands.[170] As Colonel H.N. Worthley observed, the military identified a biological agent that would be both effective in destroying crops and "one that could not be identified as such by the enemy."[171] For instance, the USBWC Committee identified New Guinea as a prime target for crop destroying toxins, as the island contained 3000 acres of mainly root crops.[172]

These plans for deployment became much more specific and targeted as 1945 wore on. The day before the military's target date for offensive operationality, March 31, 1945, top military strategists formulated a plan for destruction of Japanese rice crops. The objective was destruction of more than thirty-percent of Japan's rice crops by 1946. General Porter supplied specific logistics such as 3.5 million pounds of the biological agent VKA and 1500 airplanes with crew trained for low level operations to spray the agent.[173] This evidence reveals that the United States had planned to use offensive biological warfare to win the War in the Pacific.

On August 6, 1945, the United States dropped the first atomic weapon on the Japanese city of Hiroshima, which led to the surrender of Japan and the end of World War II. The War was over shortly thereafter and the United States never deployed any of its biological weapons. But there were numerous post-war indications that confirmed the United States had planned on deploying offensive biological weapons in the Pacific theater in the latter part of 1945. As discussed in the introduction of this thesis, President Truman, in his last full day in office, identified offensive biological weapons as the alternative to the atomic bomb. The reason for his choice appeared to be his perception that biological warfare was less lethal. This is certainly debatable.

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[170] "Japanese Gardens in the Southwest Pacific Theater."
[171] "First Meeting of United States Biological Warfare Committee."
[172] Sarles, "Report of Meeting, 28 December 1944."
[173] Porter, "Military Requirement for Crop Destruction in Japan," March 31, 1945.

The understanding of how close the United States was to deploying offensive biological weapons against Japanese crops was made much more explicit in recently declassified documents on the American BW Program. Indeed, one United States official confirmed in 1946 that "it is felt that had the war against Japan lasted many months longer, that the food supply of that country would have been seriously interfered with."[174] Biological weapons were not explicitly mentioned, but it is clear that the author identified the plans to destroy parts of Japan's food supply through crop destroying toxins that were being mass produced at the time. Another United States official shared in 1948 that: "Had the war continued a few months longer, it is believed that these agents would have found actual employment, at least on a small scale, in the Pacific area."[175]

Therefore, the United States would have utilized biological weapons in the Pacific theater by deploying crop destroying toxins on Japan and Japanese controlled islands if the War had lasted longer. That became unnecessary, however, after the United States dropped atomic bombs on Hiroshima and Nagasaki and Japan surrendered.

[174] Lt. Col. Arvo T. Thompson, "Report on Japanese Biological Warfare (BW) Activities," May 31, 1945, Dugway "A" Item #2, National Archives at College Park, MD.
[175] "Directive: Formation of the Panel on Programs," January 20, 1948.

V. Conclusion: Takeaways and Implications Regarding the American Biological Warfare Program During World War II

The United States never employed biological weapons during World War II and thus many Americans and scholars are not aware of the existence of the extensive and successful American BW Program. This thesis aimed to synthesize and analyze newly declassified documents and other sources to consider the development of the Program through the wartime period.

One interesting aspect of the Program was what group led it—civilians or the military—as that determined the direction and priorities of the Program. I claimed that the direction of the American BW Program depended on the particular wartime period, with civilian scientists driving a largely defensive focused program early, and a once-disinterested military taking control and changing this focus to offensive uses later in the War. I also contended that the United States had developed operational offensive biological weapon capabilities by 1945. Ironically perhaps, the genesis of the United States' offensive biological warfare capability was its desire to perfect its defenses against enemy biological weapons. Ultimately, the United States had such advanced offensive biological weapons capabilities that it secretly mass produced large quantities of biological agents and armaments.

Finally, I argued that the United States military intended to use its offensive biological weapons to end the War with Japan if it progressed farther into 1945. The United States planned to destroy Japanese crops with its biological weapons—which again it mass produced. These plans were rather specific and were confirmed post-war. The American BW Program transcended simply scientists. Military officials directly worked on the Program with the blessing of top American officials such as Secretary of War Stimson and Presidents Roosevelt and

Truman. These American leaders had very limited knowledge about biological weapons but were still tasked with deciding whether to use them in World War II. They would have done so if not for the immense power of newly created atomic weapons.

A major implication of the United States' offensive biological warfare operationality during World War II was its effect on the beginning of the Cold War, directly after peace was achieved both in Europe and Asia. Historians and scholars posit that American strategy surrounding weapons of mass destruction and game theory originated during World War II, but this paper suggests otherwise. In fact, there was a real push to understand other countries' strategies surrounding weapons with immense power in the late 1930s and early 1940s. Unlike traditional scholarship that has focused on atomic weapons and American policy makers' fears that the Soviet Union may have their own atomic weapons, both Stimson and Merck were very concerned about Japan's and Germany's biological arsenals. The American BW Program actively planned for the usage of these weapons and dedicated immense financial and operational resources into defending against unknown enemy biological weapons programs. Endicott and Hagerman have published thoughtful work on potential biological weapons use by the United States in the Korean War but there is still much to be done. The recent declassification of documents about the American BW Program, which is the backbone of my primary source research for this thesis, is a step in the right direction. Nonetheless, the full nature of the American BW Program still only exists in the pages of classified government documents.

Another key implication of this thesis is the disturbing alternate reality where the United States executed its plan to deploy biological weapons. Surely the post-World War II international establishment would have been quite different if the United States employed biological weapons. Instead of falling into the annals of history, biological weapons and their shockingly destructive

capabilities would have been amplified like atomic weapons were in the aftermath of their use in Japan. Much academic work would have also been devoted to the American BW Program and could have rivaled the large amount of scholarship and larger cultural significance that the Manhattan Project holds in the present. Potential use also could have seen long-term suffering for those in Japan, Southeast Asia, and the globe more generally. Crop-destroying toxins were meant to starve entire populations and if the predictions made in correspondence between American scientists and top military officials were realized, years of suffering would have been endured by innocent men, women, and children in Japan and the surrounding areas. Interestingly, none of the declassified documents proposed how those populations would be fed.

Consideration of the American BW Program during World War II would not be complete without acknowledging the beneficial, long-ranging implications of its successes. They included expanding understanding of airborne diseases and human immunity as well as developing rapid detection of small amounts of disease, medications for a variety of diseases, methods for mass production of microorganisms and "experimental animals," capabilities to photograph airborne diseases, and personal protective equipment.[176] As Merck observed in October 1945, the information garnered through the American BW Program during World War II "will be of great value to public health, agriculture, industry, and the fundamental sciences" in the future.[177] That same month Surgeon General Ross McIntire similarly noted that: "because of our research and development in biological warfare, we have developed techniques that will advance preventive medicine in a manner that would have been impossible without it, and that we have developed methods for the control of animal and plant diseases which will be of lasting value in

[176] Merck, "Final Report to the U.S.B.W. Committee."
[177] Ibid.

agriculture."[178] Finally, in contrast to result of the Manhattan Project, the American BW Program represents possibly the only area "of research in the military interest that [has] yielded results of greater value for the public welfare."[179] The Program during World War II, accordingly, had beneficial effects for humanity.

The importance of the question of potential use and consequences of biological weapons is amplified when the COVID-19 pandemic is brought into the equation. There have been some in the international community that have claimed COVID-19 to be a biological weapon employed by the Chinese to achieve more global dominance. At this moment, this is a fringe opinion by many who specialize in conspiracy theories. A more popular and widespread belief was that the virus was either accidentally released out of a lab in Wuhan, China or originated from a wet market. Whatever the origination, it makes the stakes of biological weapons usage much more disturbing. If COVID-19 was an accidental occurrence and has cost millions of lives worldwide while shutting down the globe for multiple years, what harm could a biological weapon like those produced by the American BW Program have wreaked globally? Indeed, scientists after the War acknowledged, for instance, that one milliliter of a refined psittacosis virus could kill twenty million people.[180] American scientists and leaders like Truman were largely unaware of the possible consequences that would come into play if biological weapons (even crop destroying toxins) were used and were apparently content with use of such weapons. Those in the Manhattan Project were equally unsure about the long-term consequences of atomic weapons but one must wonder about the long-term consequences for global health if crop-destroying toxins, anthrax, or botulinus toxin were employed.

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[178] McIntire, "Release of Information on Biological Warfare."
[179] Ibid.
[180] Rear Admiral Ellis M. Zacharias, "Absolute Weapons....More Deadly Than the Atom," *UN World*, November 1947, RG 218, UD 92, Box 19, National Archives at College Park, MD.

Biological warfare is a form of war-making that is still largely unexplored by scientists and scholars alike. As discussed in this paper, the American BW Program has ultimately helped humanity in its fight against disease, but the consequences of the Program's development of offensive biological weapons is alarming. It is true that President Richard Nixon banned offensive biological weapons production and research in 1969. One must hope, however, that this form of warfare forever ceases to be an option after becoming operational during World War II. If the last two years have taught mankind anything, it is that infectious diseases can affect every human on the planet in significant and horrific ways.

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