ABSTRACT


This thesis will examine the triumph over anthrax that never really happened. In the history of diseases and medicine, Triumphalism or the triumphal story is a common genre of historical writing. At first glance, it may seem as if the standard triumphal story applies to the history of anthrax. Robert Koch and Louis Pasteur, the heroes of bacteriology, made their major discoveries in anthrax in the 1870s and 1880s. Then, John Henry Bell’s work in the Bradford wool mills in England created a practical application of Koch and Pasteur’s findings. Bell makes his recommendations to the British government, and the story is over. The disease is understood, and thus there is a medical standard to follow. But it is doubtful that there will be very many more cases because science and medicine have solved the problem. Unfortunately, this narrative is just too simple, and in this thesis, I will show how anthrax does not fit into the mold of a triumphal story and is, instead, a story about an industrial disease all along using outbreaks and legislation that manifested after Koch, Pasteur, and Bell made their breakthroughs in the 1880s.
THE CONQUEST OF WOOLSORTERS’ DISEASE (INDUSTRIAL ANTHRAX) THAT NEVER HAPPENED

by

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HISTORY

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DEDICATION

This thesis is dedicated to my late grandmother, Clara Collier, who believed I could do anything I set my mind to.
BIOGRAPHY

Sarah Collier was born and raised in McMinnville, Tennessee. She received her undergraduate degree from East Tennessee State University in Johnson City, Tennessee in May, 2005. Sarah will graduate with an MA from North Carolina State University in August, 2007.
ACKNOWLEDGMENTS

I would like to thank Dr. William Kimler who provided comments on countless drafts and encouragement when I encountered setbacks. His support helped to make this researching and writing process as enjoyable as it was educational.

In addition, I would like to thank Dr. Melvin Page who pushed me to become a better historian. Thank you for your continued encouragement over the years.

To Brad, your support and feedback have meant the world to me. Thanks for being there for the good times as well as the rough.
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INTRODUCTION

My thesis is about the triumph over anthrax that never really happened. In the history of diseases and medicine, triumphalism or the triumphal story is a common genre of historical writing. The narrative structure is made up of four key elements: an enemy, an individual on a quest, a key event or crisis, and a triumphal hero. The enemy is the presence of a disease that plagues a given society. A person or perhaps an entire community becomes ill with a disease that has no cure. For example, cholera was a horrendous disease that killed hundreds of thousands of Europeans in the nineteenth century.¹ Mysterious in origin, it swept through cities in lethal epidemics, during which the afflicted rapidly declined and succumbed.

The second element of a triumphal story is an individual on a quest to bring about the end of the enemy. In the case of diseases, the hero is often a physician or scientist who has a unique and usually disregarded scientific insight. Pursuing his idea, the hero devises some sort of treatment. But throughout all the drama that surrounds the individual and his quest, it is understood that he is destined to conquer his foes. In the standard story of cholera, the London physician John Snow found the solution to England's epidemics, through his unique use of maps locating cholera cases in London, and his insistence on water-borne contagion as the cause.

The third element of a triumphal story about subduing disease is a key event that brings the hero’s efforts to a climax. This event usually involves a public test or experiment, something tangible that large numbers of people can witness. Victims are saved, and the

¹ Ralph R. Frerichs, “John Snow - A Historical Giant in Epidemiology,” UCLA School of Public Health, Department of Epidemiology, http://www.ph.ucla.edu/epi/snow.html. In the following paragraphs, the historical treatment on this website about John Snow and his work with cholera provides the example of a triumphal narrative.
result is a public triumph in the conquest of the disease. In the triumphs of scientific medicine, the event is usually a moment of scientific discovery, a sudden insight from the evidence. It turns out to be the key to prevention or cure. For cholera, this event is seen in the famous Broad Street pump story. During Snow’s mapping exercises, he was able to deduce that a great number of cases centered around the public water pump on Broad Street. The one thing the victims had in common was their use of water from that particular pump. When Snow had the handle removed from the Broad Street pump, the number of cholera cases subsided. The event gave conclusive proof of the connection between contaminated drinking water and cholera, which became the key to epidemic control in London.

The fourth element of the triumphal story is the elevation of the individual to the status of revered hero, in celebration of victory over the conquered foe. There is a sudden rush of support in the form of both public and professional fame. At this point, the story ends because the mystery of the disease is solved. Prevention or cure in hand, the disease ceases to be a problem. Because of his work with cholera, Snow is now referred to as the “greatest doctor of all time” and the “Father of Modern Epidemiology.”2 Given the understanding of contaminated water, the public considered cholera to have been solved, and the battle against it won in the mid-1800s. Snow has been immortalized as the man who saved the world from cholera. Today there is a society named in his honor that promotes his life and work as well as a college in England named after him. There is even a John Snow Pub located only a few steps away from the location of famous Broad Street pump. Though the original pump is no

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2 Frerich’s website on Dr. John Snow cites a March 2003 survey in Hospital Doctor in which doctors were polled on the “greatest doctor” ever. Snow’s cited accomplishments also include the development of ether and chloroform techniques of anesthesia, especially for childbirth, and helping found intensive care medicine. Ralph R. Frerichs, “John Snow - A Historical Giant in Epidemiology,” http://www.ph.ucla.edu/epi/snow.html.
longer there, a replica has been stationed in its place with a commemorative plaque attached to its base.

The triumphal story carries implicit meaning in the history of medicine and science. By their very nature, triumphal stories are Whiggish, in that from the beginning of the story there are ‘winners’ and ‘losers.’ The winners were always on the correct path to making discoveries while the losers were never even close. This kind of interpretation takes scientists out of the context of confusions and competing directions and hypotheses. The Whiggish nature of the triumphal story removes the equal ground: the winners were always meant to win and the losers were always destined to lose. Whiggish writing also conveys the inevitability of progress, especially in the history of science. This, as a result, builds a sense of expectation that the triumphal story will end with an immense feeling of conclusiveness. The story is over and further research only aids to support the narrative, not rewrite it. It is a standard practice of the historian of science and medicine to be alert and averse to this type of interpretation. Despite such historiographic sensitivity, the ‘triumph’ form still appears in works on the ‘conquest’ of particular diseases and on the breakthroughs by ‘heroic’ figures. Triumphal stories are enjoyable to read because there is a villain, a hero, and a great battle, and in the end the hero always wins. ³

This is not always a reflection of reality. Although there might be diseases fitting such triumphal stories, anthrax or woolsorters' disease is not one of them. At first glance, it

may seem as if the standard story applies to the history of anthrax. Throughout the 1700s, imprecision of diagnosis gave way gradually as scattered clues accumulated in descriptions of the disease. Other names for anthrax over the years include splenic fever or splenic apoplexy (in animals), malignant pustule (the human cutaneous form), and woolsorters’ disease or industrial anthrax (the human pulmonary or industrial form). In German, it was often called *Milzbrand*, and in French, *charbon*. Scholars have used several spellings of woolsorters’ disease, the form of anthrax contracted via one's occupation. Dr. John Henry Bell, however, termed occupational anthrax as either “wool-sorters’ disease” or “woolsorters’ disease.” For the duration of this thesis, I will be using his term “woolsorters’ disease.” That is not to say that sorters were the only workers exposed to industrial anthrax. Any worker who came into contact with infected hair, fur, wool, or hides, including all mill workers, tannery workers, farmers and even workers who transported raw materials, was at risk of contracting anthrax. Bell’s term, woolsorters’ disease, refers only to the cases he researched and not all cases or forms of industrial anthrax.

By the mid-1800s, a handful of investigators had made connections between livestock, wool and hair work, animal anthrax, characteristic black lesions on people, and microorganisms seen in the blood. Robert Koch and Louis Pasteur, the heroes of bacteriology, made their major discoveries about the bacterial cause of anthrax in the 1870s and 1880s. Then, John Henry Bell noted the high frequency among workers who handle raw wool and hair in factories. This line of work is particularly dusty, and raw wool and hair are often caked with pieces of dirt or blood that may be infected with anthrax spores. His work in the Bradford woolen mills in England created a practical application of Koch’s and Pasteur's findings. Bell made recommendations to the British government for the prevention of
infection. At this point, the standard story is over. As Sheridan Delépine, Professor of
Pathology at the University of Manchester, wrote in an historical overview in 1902,
“although many important additions to our knowledge of the properties of the bacillus
anthracis and its mode of action upon the tissues have been made by a number of
distinguished observers since 1881, none of them have had the same influence upon medical
science as those which have been referred to in this short summary.”4 The disease was
understood, and thus there was a medical standard to follow. It was assumed that there would
be few subsequent cases because science and medicine had solved the problem.5

Even when the standard narrative is expanded, it is still done so to honor the
precursors and early discoverers who built the path to Koch, Pasteur, and Bell. In the medical
history literature that lists the early investigators and discoveries, the “triumph” centers on
Koch or Bell. David Morens, for example, published a corrective to the singular story about
Koch, writing that “in 1876, Robert Koch established anthrax as the first disease linked to a
microbial agent. But Koch’s efforts had followed more than 150 years of scientific progress

5 Today, anthrax is defined as a zoonotic disease communicated from animals to humans by the bacterium
Bacillus anthracis. Outside the host, exposed to oxygen, B. anthracis forms highly resistant spores, potentially
virulent for many years. Anthrax most often affects livestock, including cattle, sheep, horses, camels, and goats.
Livestock become infected with the disease while grazing in the fields where other animals have died from
anthrax. Spores in the soil, via the animal’s blood, can remain virulent for several years. Other animals that are
put to graze in the area will eat the grass that is contaminated with anthrax spores. Those animals will
subsequently become ill and die, thus creating a cycle for the transmission of anthrax from animal to animal.

Humans are subject to anthrax if exposed to spores from diseased animals. Tanners, butchers, or wool
and hair workers handle the spore contaminated fur, hides or meat. First, people can come in contact the
contaminated meat. The least amount of scholarly research has been done on this form of anthrax. Second,
people who handle fur or hides and have open cuts on their bodies can become infected by anthrax cutaneously.
The point of entrance in the body forms a black lesion which if on the extremities, such as hands, arms, and
legs, is usually not fatal. Lesions on the face and neck are often more fatal than those on the extremities. The
third form of anthrax is the inhalation kind. The inhalation form of anthrax is more commonly an industrial
disease, and is, by far, the most fatal. This form is described as woolsorters’ disease. Lise Wilkinson,
“Anthrax,” in Kenneth F. Kiple, ed., The Cambridge World History of Human Disease (Cambridge; New York:
in characterizing anthrax as a specific human and veterinary disease.” Even so, Morens describes the early work in terms of being “just as important as Koch’s later triumph.” An example of the triumphal ending of the problem appears in a brief history prepared for the federal Office of the Public Health Service Historian in 2001:

Over the next fifteen hundred years, Europe witnessed sporadic outbreaks of anthrax, with the most acute outbreaks occurring in fourteenth-century Germany and seventeenth-century Russia and central Europe. Despite the threat these outbreaks posed to livestock, it was only in 1769 that Jean Fournier classified the disease as anthrax or charbon malin, a name undoubtedly derived from the black lesions characteristic of cutaneous anthrax. Fournier also noted a link between those who worked with raw animal hair or wool and susceptibility to anthrax.

In 1850, Pierre-Francoise Olive Rayer and Casimir-Joseph Davaine reported the presence of “small filiform bodies” in the blood of anthrax-infected sheep. Five years later, Franz Aloys Antoine Pollender confirmed this discovery and speculated that these bodies might cause anthrax. In 1858, Freidrich [sic] August Brauell noted that these “small filiform bodies” never appeared in healthy animals or in animals infected with diseases other than anthrax. Brauell also noted that pregnant sheep who were infected with anthrax did not transmit the disease to their fetuses.

By the mid 1870s, most researchers believed that anthrax was an infectious disease but there was still disagreement as to its specific cause. In 1876, Robert Koch, a Prussian physician, isolated the anthrax bacillus and pointed out that the bacillus could form spores which remained viable, even in hostile environments. According to Koch, “this remove[d] all doubt that Bacillus anthracis is the actual cause and contagium of anthrax.” Shortly after this, John Bell linked anthrax with “woolsorter disease” and developed a procedure to disinfect wool.

William Greenfield was the first to immunize livestock successfully against anthrax in 1880. However, credit for the use of a live vaccine against anthrax is usually given to Louis Pasteur who tested a heat-cured vaccine on sheep in 1881. Celebrated in the contemporary French press, Pasteur’s vaccine solidified his status as one of France’s greatest scientists. By the late twentieth century, extensive animal vaccination programs led to an overall decline in anthrax although the disease still occurred in poor and unstable regions. . .

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The confusions and disagreements were resolved by Koch’s insight, which immediately resulted in Bell’s solution. Vaccine quickly followed, and then no more is said about the next century, other than the “overall decline” in cases.

A similar example of a triumphal ending is found in Kenneth Kiple’s volume *The Cambridge History of World Disease*. In Lise Wilkinson’s article on anthrax, she devotes about a page to the work of Koch, Bell, and other early anthrax scientists like Davaine and Rayer. She states:

In France, Eloy Barthélemy established the transmissibility of anthrax in feeding experiments with horses in 1823. From 1850 onward, study of the putative agent was pursued by workers in Germany and in France, beginning with the results obtained by Aloys Pollender, then by Pierre Rayer, and finally by Davaine who, during extensive work with guinea pigs in the 1860s, bestowed on it the name of *bactéricide*, which survived in the literature for a long time. From 1876 onward, the anthrax bacillus became a cornerstone of both Koch’s theories and his development of pure culture methods. . . .

In Great Britain, industrially acquired anthrax became a notifiable disease in the Factory and Workshops Act of 1895; the incidence was reduced when the Anthrax Prevention Act of 1919 prohibited importation of certain types of potentially contaminated material. Since World War II, following the introduction of antibiotic therapy, the number of fatal human cases has been substantially reduced.\(^8\)

Once again, anthrax is completely ‘solved’ after 1876 and Koch’s work. After Koch’s time, the only issues worth noting are two pieces of legislation that helped reduce the number of cases and the introduction of antibiotics as a cure. Nothing else is worth mentioning after World War II.

Despite the lack of attention in standard narratives to the century following Koch and Bell, it is hard to see how anthrax was ‘conquered’ in the 1880s. After discovery of its cause, the anthrax story continues beyond the 1880s. The serum therapy ‘cure’ of 1895 was

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erratically effective, and dangerous adverse reactions made it problematic. Second, as Lord’s brief history acknowledges, several outbreaks occurred in the United States in the 1950s, and the FDA did not license a vaccine until 1970. It is these post 1880s occurrences that beg the question if anthrax is still a problem after the 1880s, why are medical journals overflowing with prevention research? Why is the public not outraged? And, perhaps most importantly, what else has the triumphal narrative omitted? These are some of the questions that fueled my research.

Chapter 1 is a detailed version of Koch’s, Pasteur’s, and Bell’s work that makes up the foundation of the triumphal story. The chapter is divided into three sections. First, “The Progress Narrative” will briefly look at the scientific work of those who came before Koch. Second, “Bacteriological Conquest” will evaluate Koch’s and Pasteur’s anthrax research. Last, “Medical Intervention” will discuss Bell’s role in connecting the anthrax research to the textile industry. I necessarily present a triumphal account, in order to then discuss how the triumphal story is inaccurate. While the most noted research on anthrax and its prevention may have been in the 1880s, the story does not end there, as most scholars would have one believe.

Chapter 2 begins to disrupt the triumphal narrative, by examining how anthrax was first and foremost an occupational disease until the bacteriological field began to research it and how anthrax remained an occupational disease decades after bacteriology classified human anthrax as conquered. This chapter is divided into seven sections. First, “Industrial Health and Disease” will present an introduction to the history of industrial health and its role prior to the ‘victories’ of the 1880s. Next, “Wool and Hair Manufacturing” will take an in

depth look at the process of manufacturing goods from raw hair and wool and the potential for contracting anthrax in such occupations. Third, “Public Education and Early Legislation” will show the measures several countries took to ensure their working class was aware of the dangers associated with their jobs. This section will also discuss occupational health legislation in the United States during the first decades of the twentieth century. Fourth, “Industrial Anthrax Treatments” will evaluate treatment options and their relative successes. Next, “Anthrax and the Consumer” will discuss how anthrax made its way into the headlines of the New York Times when consumers of hair and hide goods were potentially at risk. Sixth, “Industrial Anthrax Internationally” will look at the disease on a more global level and what measures other nations besides the United States were taking to control their anthrax problems. Lastly, “Climax and Decline of Industrial Anthrax in the United States” will discuss the 1940s through ’60s, the years in which the United States experienced its largest outbreak of human anthrax and the subsequent decline of cases.

This thesis will serve two primary functions. First, it will help to broaden the general knowledge of anthrax. Many people today do not realize that long before anthrax was a bioterrorism threat, it had a more prominent role as an industrial and livestock disease. People did not fear anthrax contamination in their mail. They worried about woolsorters’ disease while at work in the textile mills. To gain a greater perspective about what happened with the anthrax attacks in 2001, people need to know that anthrax has a much richer history beyond its role as a bioterrorism agent.

Second, my thesis will aid in the general struggle to dismantle the grip that triumphal narratives have on the general public. People grasp onto triumphal stories because they are easy to remember and recall. These types of stories are short and simple with clearly defined
heroes to whom we attribute singular achievement. The textbook industry frequently portrays them, and physicians often hang in their offices paintings of great physicians from the past at their individual eureka moments. But, triumphal stories do not tell complete narratives. They are only half-truths. Retelling science’s greatest stories should include all pertinent figures and not just the ‘big names.’ Medical discoveries are also not just linear stories in which ‘A’ leads to ‘B’ which leads to ‘C.’ Medical discovery stories have dead ends and they are not always simple conquest stories. These various facets yield a real and complete history of who historic figures were and what they did. They also help to include the characters whose role has long been brushed aside or even forgotten.

In reality, the medical work of Koch and Pasteur that the triumphal narrative focuses primarily on is only a small section in the lengthy history of anthrax. Black lesions were commonly noticed on the head and extremities as an occupational disorder of workers who handled raw hair, wool, and hides in the 1700s. Scientists researched these “malignant pustules” in an occupational atmosphere until the 1880s when Koch and Pasteur made anthrax more of a medicine problem rather than an occupation issue. After that decade and the ‘conquering’ of the disease, anthrax fell out of the limelight of medicine and there was no impact resulting from the research of the 1880s. Even though medicine ‘conquered’ anthrax there was nothing new for the industry to act upon. Anthrax returned to being solely an occupational disease issue whose major champions were no longer physicians, but social activists and government established boards.

The anthrax story remained solely an occupational issue until the late twentieth century when people began using it as a bioterrorism weapon. Modern references to anthrax as a bioterrorism weapon usually refer to the inhalation form and not the cutaneous form. But
the anthrax of history was most commonly the cutaneous form. It was the focus of much of
the research on anthrax, defined by the black lesions on the skin of workers who handled raw
hair, wool, and hides. In the mid-1800s, anthrax also became recognized as an inhalation
disease. The triumphal story of anthrax focuses on the bacterial agent, and only notes the
occupational disease as the context for the discovery of a cure. I will argue for an alternative
interpretation that the history of anthrax has really been an industrial story all along.
CHAPTER 1: THE TRIUMPHAL NARRATIVE: KOCH, PASTEUR, AND BELL

Although the standard narrative starts with the early discoveries in the mid-1700s, the greatest emphasis in the anthrax triumphal story typically revolves around the work of two major scientists: Robert Koch and Louis Pasteur. Koch was a German physician who made important contributions to microbiology in the 1870s and ’80s. Pasteur was a French chemist in the same period who made dramatic and famous improvements to the understanding and management of disease. The context of this story is the dramatic rise of scientific medicine in the nineteenth century. Success with anthrax becomes another example of the benefits to medicine from new scientific investigation.

In the nineteenth century, science transitioned from a gentleman’s hobby to a legitimate career option, and it became feasible to attend school with the goal of becoming a chemist, bacteriologist, or physiologist. These scientists also established themselves as separate professions apart from people who chose to become physicians. This trend began in Germany and slowly moved to France, Great Britain, and finally, to the United States. Scientists even began to receive the same honor as other national heroes. Upon his death, for example, Pasteur received full military honors from France.

Physicians took notice of the rise in importance of science, and in the 1800s, they started to incorporate new scientific discoveries into their clinical practices. Drawing on chemistry’s advances, surgeons made use of new forms of anesthesia such as ether and chloroform to make a patient unconscious for surgery. With unconscious patients, the most revered quality in a surgeon was no longer speed. Surgeons could slow down in surgery and

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improve their technique, and develop new surgical interventions.\textsuperscript{11} By using chemistry, physicians were also able to further refine diagnostic examination. Alfred Becquerel created a standard for the “average amount of water, urea, uric acid, lactic acid, albumin and inorganic salts secreted over twenty-four hours.” He was then able to use urinalysis to compare a patient’s urine content to symptoms of certain diseases.\textsuperscript{12}

There were also great achievements due to the creation of the field of bacteriology. Before the bacteriology field was firmly established, many scientists participated in contagion studies. Originally, physicians had considered fevers to be the result of miasmas\textsuperscript{13} but did not take into consideration “rotting animal and vegetable material, the soil, and standing water.”\textsuperscript{14} But, scientists began to perform experiments to isolate certain bacteria. Koch isolated a number of bacteria in pure cultures, including the bacteria that cause anthrax and tuberculosis. Scientists then used the isolated bacteria to inoculate against infection caused by the bacteria. Pasteur’s experiments with anthrax and rabies vaccines are perfect examples of using isolated bacteria to inoculate animals. All of this helped build the germ theory of disease, the theory that a specific microorganism causes a specific disease.

Physicians then applied scientists’ findings of how certain infectious diseases were caused by known microorganism to their diagnostic and treatment methods. Scientists and physicians tackled many diseases that plagued society including cholera, tuberculosis, rabies,


\textsuperscript{13} Miasmas are poisonous atmospheric conditions that were thought to stem from putrefaction and caused disease.

\textsuperscript{14} Porter, The Greatest Benefit to Mankind: A Medical History of Humanity, 10.
and anthrax and “made spectacular leaps forward in the understanding of infectious diseases.\textsuperscript{15}

This general acknowledgment of the role of scientific discoveries in advancing clinical medicine is one part of the rise of scientific medicine. In addition, new scientific institutions were founded for the education of future scientists. Established members of the scientific communities created bodies for academic camaraderie, and some even “declared science the dynamo of progress.” The Canadian physician Sir William Osler, a prominent promoter of the new scientific medicine, stated in the late 1800s that “the physician without physiology and chemistry flounders along in an aimless fashion, never able to gain any accurate conception of disease, practicing a sort of popgun pharmacy.” Some physicians looked to scientists to advance the knowledge of fields like chemistry, bacteriology, cellular pathology, and microscopy while others took on the role of physician-scientist. Physicians transitioned from simply treating a patient’s symptoms like fever to figuring out what was causing fever at a basic level.\textsuperscript{16}

\textbf{The Progress Narrative}

The scientific triumph over anthrax is considered to begin in 1769 when Nicolas Fournier presented a new classification, connecting different lesions as one disease. In his piece, he defined an external lesion form of anthrax and an internal form that was much deadlier. Both forms were particularly found in those with contact to fur, hides, and meat.\textsuperscript{17} Eleven years after Fournier published his findings, Chabert recorded the first clinical description. Anthrax did not make another major appearance in scientific literature until 1823

\textsuperscript{15} Bynum, \textit{Science and the Practice of Medicine in the Nineteenth Century}, 129.
when Éloy Barthélemy established the nature of anthrax’s contagiousness. In the mid-1800s, Rayer inoculated healthy sheep with the blood of sheep that had died. Upon inspection of the inoculated sheep, researchers found bacterial bodies in the blood. Five years later, Pollender published an account that was very similar to Rayer’s finding. In the 1860s, Davaine broadened the knowledge of anthrax significantly when he showed that anthrax could actually be transmitted between different species of animals. He worked with horses, sheep, cattle, and others, and found that all of the animals could potentially spread anthrax to the other animals. Two years later, Davaine proved the theory that a definite disease was caused by a definite micro-organism. He worked in particular with anthrax.

This is the usual point of the triumphal narrative. Scientists in the nineteenth century worked to pinpoint a singular disease with certain symptoms. Doctors knew that most research on anthrax had been into the livestock disease, but they were well aware of its zoonotic property. They connected the human lesion disease to infected animals and their products, with increasing precision and interest. The timing of the discovery of *B. anthracis* as the definitive causal agent of disease put it right at the center of the verification and elaboration of the germ theory of disease. In fact, Koch’s demonstration that cultured bacteria can cause anthrax was the first definitive linkage of a microbe to disease. It is little wonder that the story of anthrax usually emphasizes his work.
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1769</td>
<td>Nicolas Fournier wrote first scientific literature on anthrax drawing attention to hair and wool workers</td>
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<td>1780</td>
<td>Philibert Chabert wrote first clinical description</td>
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<td>1823</td>
<td>Barthélemy established anthrax’s contagiousness</td>
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<tr>
<td>1850</td>
<td>Pierre Rayer inoculated sheep with blood of dead sheep and found bacteria in inoculated sheep</td>
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<td>1855</td>
<td>Franz Pollender published a more complete account of anthrax as compared to Rayer’s account. (Pollender wrote his report in 1849 but did not publish until 1855)</td>
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<td>1863</td>
<td>Casimir Davaine showed that anthrax could be transmitted to horses, cattle, sheep, and other animals</td>
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<td>1865</td>
<td>Davaine conclusively proved that a definite disease (anthrax) was due to a definite microorganism</td>
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<td>1866</td>
<td>Contagious Diseases (Animals) Act banned movement of diseased animals, mandated reportage of cases to Board of Agriculture, and legislated the destruction of animal corpses by burning or chemical means (England)</td>
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<td>1867-72</td>
<td>Anthrax epidemic in Walpole, Massachusetts curled hair mill killed approximately 14 workers (2% of the males from the town’s small population)</td>
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<td>1870</td>
<td>Most mill processes became mechanized except for hair and wool sorting</td>
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<td>1876</td>
<td>Robert Koch developed pure cultures and complete life story of anthrax</td>
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<td>1877</td>
<td>Louis Pasteur confirmed Koch’s results by carrying bacteria through 100 generations and producing anthrax from the last generation</td>
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<td>1878</td>
<td>John Henry Bell presented woolsorters’ disease to the Bradford Medico-Chirurgical Society</td>
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<td>1878</td>
<td>Bell presented a paper to update his opinions with the findings of Koch and Pasteur</td>
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<td>1879</td>
<td>Bell identified bacteria in the blood of woolsorters’ disease victims and diagnosed it as anthrax</td>
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<td>1880</td>
<td>Pasteur used an attenuated bacterial virus for therapeutic purposes for the first time</td>
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<td>1880</td>
<td>Koch wrote that Bacillus anthracis is the cause of anthrax</td>
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<td>1880</td>
<td>Commission of Woolsorters’ Diseases was created to find infective poison, remedies, and preventions (England)</td>
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<td>1880</td>
<td>John Spear visited workplaces and confirmed Bell’s findings. He, however, had no authority to make changes</td>
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<td>1880</td>
<td>Bradford Rules were created to provide a set of informal precautions</td>
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<td>1881</td>
<td>Pasteur successfully created first livestock vaccination</td>
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<td>1883</td>
<td>Factory and Workshop Act (1883) established a factory inspectorate (England)</td>
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<tr>
<td>1893</td>
<td>Percy Frankland established that anthrax is not waterborne</td>
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<tr>
<td>1895</td>
<td>Selavo prepared anti-anthrax serum</td>
</tr>
<tr>
<td>Year</td>
<td>Event</td>
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</tr>
<tr>
<td>1900s</td>
<td>United States experienced increase in number of cases because of infected shaving brush bristles</td>
</tr>
<tr>
<td>1905</td>
<td>Bradford Anthrax Investigation Board was created with Frederick Eurich as first presiding head</td>
</tr>
<tr>
<td>1908</td>
<td>Eurich developed more effective wool and hair disinfection processes</td>
</tr>
<tr>
<td>1911-13</td>
<td>Individual states in the United States mandated reportage for anthrax cases</td>
</tr>
<tr>
<td>1914</td>
<td>Eurich and Duckering invented the Duckering process to disinfect infected wool</td>
</tr>
<tr>
<td>1915-16</td>
<td>United States experienced a rise in the number of anthrax cases</td>
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<tr>
<td>1915</td>
<td>Prominent New York lawyer died from anthrax (thought to be caused by leather gloves)</td>
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<tr>
<td>1916</td>
<td>Bradford Anthrax Investigation Board asserted that if all blood-stained fleeces were removed, cases would be less frequent</td>
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<tr>
<td>1917</td>
<td>John Andrews claimed that the United States lagged behind other countries in anthrax legislation</td>
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<tr>
<td>1919</td>
<td>Anthrax Protection Act allowed the British government to prohibit the importation of goods infected or thought to be infected with anthrax</td>
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<tr>
<td>1920</td>
<td>Andrews claimed that the United States was still lagging in anthrax legislation</td>
</tr>
<tr>
<td>1921</td>
<td>Former New York Representative died from anthrax (thought to be caused by shaving brush)</td>
</tr>
<tr>
<td>1930s</td>
<td>Anthrax was considered to be a medical curiosity in Great Britain</td>
</tr>
<tr>
<td>1942</td>
<td>MacDonald asserted that anthrax is still an industrial hazard in the United States</td>
</tr>
<tr>
<td>1945</td>
<td>American Medical Association adopted penicillin as standard treatment for anthrax</td>
</tr>
<tr>
<td>1957</td>
<td>Manchester, New Hampshire goat hair mill experienced the largest anthrax outbreak in the United States</td>
</tr>
</tbody>
</table>
Bacteriological Conquest

Anthrax is a prominent case within this rise of new medicine, involving two leading figures of bacteriology. In the triumphal narrative, the story is told chronologically beginning with Koch’s scientific interest in anthrax in the early 1870s and moves on to discuss Pasteur’s work in the 1880s. The following narrative is a general version of the anthrax triumphal story compiled from biographies and histories of medicine and microbiology.

As a young physician, Robert Koch was able to pursue his scientific interests within the German medical school curriculum. In the German medical school, students were encouraged to learn basic research sciences in addition to their medical studies. Koch first became interested in anthrax because of the observation of the large rod-like structure of Bacillus anthracis first depicted by Davaine. This bacteria was sometimes absent in the blood of animals who died from anthrax, but scientists had found that the blood could cause anthrax in healthy animals.18 During the 1800s in France, anthrax was a horrendous disease that wreaked havoc on livestock. The French were baffled at the progression of the disease because even after the removal of deceased diseased animals from the field, other animals in the field became infected with anthrax. Though his interest in anthrax began in 1873, Koch did not present his first scholarly work on the subject until 1876. At the time, he believed that the science had solved the larger problems of anthrax’s etiology. He noted in the same year, however, approximately thirty-two ideas for further anthrax research.

Koch was finally led to publish his findings because of the “erroneous observations” of other scientists he saw in the scientific literature.\(^{19}\) His paper gave the first description of anthrax bacterial endospores and included drawings of \textit{B. anthracis}.\(^{20}\) Koch was able to produce the first pure culture of anthrax and to detail the first ideas of anthrax’s complete life cycle.\(^{21}\) His paper also provided the first substantial proof that a specific animal disease was caused by a specific microorganism, thus Koch’s paper validated the highly controversial germ theory of disease.

The following year, Edwin Klebs published a paper outlining the steps necessary to experimentally show that a specific microorganism causes a specific disease. Though Koch was the first to show a specific bacterial cause, Klebs’s paper gave a clear step-by-step process showing other scientists how to obtain similar results. Though the steps were first described by Klebs, they later became known as Koch’s Postulates.\(^{22}\) Koch was able to make use of his bacteria research and discoveries of anthrax in his later endeavors. One of these achievements was an improvement on Carl Weigert’s glass slide making techniques to create dried films of bacteria for staining. This technique produced the first photomicrographs of bacteria.\(^{23}\) Koch also used the technique to stain the bacterial flagella.\(^{24}\) His \textit{B. anthracis} work created a strong foundation in bacterial studies to aid him in his work. Another of his later and highly noted accomplishments was a paper, published in 1882, in which he details


\(^{22}\) Beck, \textit{A Chronology of Microbiology in Historical Context}, 93-5.

\(^{23}\) Lagerkvist, \textit{Pioneers of Microbiology and the Nobel Prize}, 65.

\(^{24}\) Beck, \textit{A Chronology of Microbiology in Historical Context}, 94-5.
how he isolated *Mycobacterium tuberculosis*.25 His work showed that not only can a specific
disease be caused by a specific microorganism, but a specific disease can be caused by a
specific bacterium. In his research, he used *Mycobacterium tuberculosis* to produce
tuberculosis.26

Also in his 1882 paper, Koch finally gave a description of the Koch’s Postulates.
Though Klebs outlined the steps in 1877 and Friedrich Löffler described them more clearly
in 1883, the scientific discovery that created the concepts was Robert Koch’s.27 Koch’s
Postulates can be summarized as follows:

1. It must be possible to determine the bacterium (or virus), believed to be the cause
   of a certain illness, in all diseased organisms.

2. The suspected microorganism must be isolated in pure culture.

3. Using the pure culture it must be possible to infect suitable laboratory animals
   with the disease.28

After his work on tuberculosis, Koch went on to make important discoveries in
cholera research including obtaining a pure culture of *Vibrio cholerae*.29 Koch’s career
spanned several decades at the end of the nineteenth century, and during this time, he helped
to expand the field of bacteriology. Though his later work with tuberculosis was highly
celebrated, it was his research about anthrax in the 1870s and 1880s that aided him in his
conclusions about the nature of specific bacterial causation.

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25 *Mycobacterium tuberculosis* is the bacteria that causes the disease tuberculosis.
26 Beck, *A Chronology of Microbiology in Historical Context*, 100. Koch went on to win a Nobel Prize for his
work on tuberculosis in 1905.
Though he was a contemporary of Koch, Louis Pasteur became involved with the study of anthrax by a different route. His first interest in science was actually in crystallography. His research in optical isomerism eventually led him to the chemistry of fermentation in the 1850s and ’60s. He went on to study yeasts and show that they are able to grow both in aerobic and anaerobic conditions. Pasteur also worked to disprove the theory of spontaneous generation, and in doing so, showed how to maintain a sterile atmosphere. These findings would later allow scientists to culture an organism in the total absence of any other organisms, thus allowing scientists to observe an organism and its properties in its true form.\(^\text{30}\) Pure cultures played a significant role in the germ theory of disease. Pasteur used his research on sterile culture techniques to further the knowledge of infectious diseases. His greatest contribution to the study of anthrax came in 1881 with his development of the anthrax vaccine.

Typical of his career in addressing public problems, Pasteur recognized that the solution to the anthrax problem was of the utmost importance to the French population.\(^\text{31}\) In his laboratory, he worked with Charles Chamberland and Émile Roux to cultivate \textit{B. anthracis} at 42-43\(^{\circ}\)C in extremely thin culture layers. The men claimed that the elevated temperature led to the attenuation of the \textit{B. anthracis} which made the vaccine safe to use.\(^\text{32}\) To prove his findings, Pasteur opted for a large public demonstration at Pouilly-le-Fort near Melun, France. On May 5, 1881, Pasteur separated his experimental herd in half and administered a living attenuated vaccine to twenty-four sheep, one goat, and six cattle. The control half of the herd of animals received nothing. On May 17, the test animals received


\(^{32}\) Beck, \textit{A Chronology of Microbiology in Historical Context}, 100.
another stronger round of anthrax vaccines, while the control animals once again received nothing. Fourteen days later, on May 31, Pasteur inoculated the entire herd with a highly virulent form of the *B. anthracis*. In two days, every non-vaccinated control animal had died or become seriously ill while the vaccinated animals continued to be healthy.

Since Pasteur had made his experiment a public trial, the general public was aware of what Pasteur was doing in Pouilly-le-Fort,\(^33\) and their response to the livestock vaccine was very positive. Their reaction prompted more vaccines to be prepared and widely used on the French livestock.\(^34\) Pasteur’s public experiment also gave the still controversial germ theory of disease a boost in popular opinion.

But Pasteur was not seeking public support for basic microbiological theories. He was more concerned with solving the problems of France and helping to expand knowledge of prevention and cure of diseases. He moved quickly to his next project: rabies. Typically, rabies is given far more attention than anthrax in the literature on Pasteur, but the anthrax problem was exceedingly important to French agriculture. But why is anthrax so often quickly glanced over in the history of Pasteur’s work? It is possible that anthrax is important but receives reflected glory only from Pasteur’s even more celebrated rabies work. Pasteur is one of the big names in the bacteriology field and his work on rabies was heroic in the way it alleviated public fear. His anthrax work then became great by association. It is also possible that the triumph of Pasteur’s anthrax work was a stepping stone on the path towards solving other human diseases. Anthrax was predominantly known as a livestock disease, and Pasteur’s discoveries about a livestock disease led to significant progress in diseases that


affected humans, like rabies. Rabies was one of the most feared diseases of the time because of the disturbing, inescapable death attributed to it. Pasteur received greater fame for his rabies vaccine than he did his anthrax vaccine. It was his rabies work that allowed Pasteur to become a huge public success by 1884.

Pasteur was known to have a knack for publicity and was able to present his experimental results in a much more successful and conclusive light than they oftentimes actually were. In his book The Greatest Benefit to Mankind, Roy Porter asserts that Pasteur’s work had “captured the world’s imagination and vindicated the role of experimental biology,” and his rabies vaccine spawned “national enthusiasm.”35 Several people played a role in creating national enthusiasm, however. Pasteur had a following of pupils and friends that made sure his work was published in popular science articles and brochures.

Pasteur harnessed this enthusiasm to call on his associates to delegate funds to the founding of an “antirabies vaccination establishment.” In his mind, it was the next logical step after devising a standard rabies prophylaxis. In 1888, the Institut Pasteur was set up and there was no shortage of donations. Pasteur also saw the institute as providing him the opportunity to study many other contagious diseases and microbes and not solely rabies. 36

It is important to note that there was a significant difference in the public’s reaction to the anthrax vaccine and the rabies vaccine. The rabies vaccine worked on animals and Pasteur showed that it could also work on humans. An exceedingly well-funded institute resulted from his research. But what about the anthrax vaccine? There was no creation of an anti-anthrax vaccination establishment. Why was there a difference? Rabies directly affected

36 Patrice Debré, Louis Pasteur, Translated by Elborg Forster (Baltimore: Johns Hopkins University Press, 1994), 462 and 467.
humans. It was quite easy to be bitten by a rabid dog along the streets of any large city in the 1800s. But anthrax was much more difficult to contract. Anthrax was primarily a threat for the farmers and their livestock. While a handful of farmers did contract anthrax, it was usually the cutaneous form that is not very often fatal. People were more afraid for their sheep, cattle, and goats rather than themselves.

But whether it was the anthrax or rabies vaccine that caused the public to gain trust in Pasteur’s vaccines, the outcome was the same. With all of his success with anthrax and rabies vaccines and later with the Institut Pasteur, Pasteur gave the public the opinion that science was miraculous and that “instant therapeutic breakthroughs” were possible. All that was required of scientists to make such breakthroughs was to discover and isolate a “relevant micro-organism.” After that, common sense dictated that “an appropriate vaccine would follow as the night the day.”37 People thought that mankind’s salvation was at hand and it would not be long before the end of popular suffering.38 In the mind of the public, the possibilities of science and medicine were endless, especially if research funds were made available.

An excellent example of belief in this ideal is the founding of the Rockefeller Institute for Medical Research. In January of 1901, John D. Rockefeller’s grandson died from scarlet fever. Legend has it that Rockefeller was deeply saddened by the boy’s death and asked the doctors what it would take to develop a cure. The doctor’s response was that money and a place for research would help to bring about a cure to scarlet fever. Based on the doctor’s response, Rockefeller, along with his advisor, Frederick T. Gates, and his son, John D.

38 Debré, Louis Pasteur, 461.
Rockefeller, Jr., created the Rockefeller Institute for Medical Research that opened in June of the same year in New York City. Gates was deeply impressed by Osler’s work and desired an institute like Pasteur’s to perform pure research. Following the model of the Pasteur Institut, Rockefeller and his associates founded the Rockefeller Institute with the idea that with enough money any disease could be cured through bio-medical research.\textsuperscript{39}

The work of Robert Koch and Louis Pasteur provides the basic foundation for the triumphal story about the solving of the anthrax mystery. They were the heroes of singular scientific achievement, whose simple demonstrations and applications, in one step, conquered an ancient threat to health. The rise of scientific medicine and triumphalism can go hand in hand. Scientists made astounding discoveries that rocked society, and physicians successfully treated more infectious diseases whose prospects had been overwhelmingly grim only a few years earlier. The general public was exposed to numerous public demonstrations and experiments and had a solid hope in the future scientists and physicians seemingly promised. It is easy to see how someone could interpret this hope and take it to another level of greatness, making the narrative a triumphal story. Koch and Pasteur’s work with anthrax was a good example of an infectious disease that was “conquered” during the rise of scientific medicine. Anthrax was a disease that affected people and decimated livestock populations in Europe. Koch and Pasteur’s work led to a public showing of how the disease could be vaccinated against in livestock. After the vaccine, the anthrax problem was “solved.” What else could be left to do if medical science knew what caused a disease and had the means to prevent it?

\textsuperscript{39} “Rockefeller University – History,” \url{http://www.rockefeller.edu/history.php}. 
Many triumphal narratives about anthrax conclude at this point. The anthrax story usually supports a larger narrative about the triumph of germ theory and the origins of modern “scientific medicine.” With anthrax playing a crucial role in discovery and demonstration, microbial causation of disease was established and a scientific methodology laid out in Koch’s Postulates. Vaccines and prevention became established procedures, part of the ordinary practice of modern medicine. But the anthrax story was far from complete with the work of Koch and Pasteur.

**Medical Intervention**

Within a narrower story of the conquest of anthrax itself, one more hero exists. John Henry Bell, a British doctor working in the textile region of northern England, was a contemporary of Koch and Pasteur. Born at Bradford, England in 1832, Bell was the son of Scottish parents. Bell attended school until the age of fourteen when he accepted a six-year medical apprenticeship under the direction of Dr. Corrie in Thornton, England, near Bradford. 40 Afterwards, Bell attended Leeds Medical School and served as an assistant to Dr. Braithwaite. While most students in the Leeds College of Surgeons required three years of medical curriculum to take their final examinations, Bell petitioned that he be allowed to attempt the examinations after only two years. With one day’s notice, Bell took and passed all the examinations necessary to obtain the M.R.C.S. and L.S.A. 41 in 1857.

Bell’s hard work was rewarded with a membership to the “Hey Society,” a small medical society named after the surgeon, Hey. For many years, the prestigious Hey Society limited its membership to only twelve people. When Bell eventually became president of the

41 Member of the Royal College of Surgeons and Licentiate of the Society of Apothecaries, respectively.
Hey Society, he presented the first description of miners’ nystagmus, a coal miners’ occupational disorder that is marked by “involuntary rapid eye movements.” Bell’s description helped make his name known in the scientific field. Another one of Bell’s early accomplishments was the joint foundation of the Royal Eye and Ear Hospital. He was one of the first surgeons at the hospital and provided roughly forty years of service. After retiring in his later life, Bell remained on at the Royal Eye and Ear Hospital as a consulting surgeon.

Despite these two early achievements, Bell is best known for his work with woolsorters’ disease. Bell’s practice was situated in Bradford, one of the largest textile producing areas in the world. The home of his alma mater, Leeds, was another significant textile area. Thus, Bell’s practice was centered in one of the greatest textile hubs in the world. While a practicing surgeon in Bradford, Bell noticed the astonishing rate of sudden deaths among young, healthy men employed in the wool industry, many of whom were his patients. Bell’s first thoughts were that the disease he witnessed was “due to germs produced by decomposing animal matter in the wool bales” the wool workers came into contact with on a daily basis. Later, at the suggestion of Dr. John Eddison, Bell investigated the 1863 work of Davaine with splenic fever in sheep and cattle.

In 1878, Bell presented a paper entitled “Woolsorters’ Disease” to the Bradford Medico-Chirurgical Society (BMCS). In his presentation, Bell put forth two different theories on the causes of woolsorters’ disease. First, he postulated that the woolsorters were having respiratory afflictions triggered by the dust and hair that were commonly present in

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wool sorting rooms. Second, Bell proposed that an infectious disease, present in the animal fleeces they worked with, was affecting woolsorters. Bell disproved his first theory citing that woolsorters were not more susceptible to respiratory illnesses than other workers in dusty occupations. On the other hand, Bell was not entirely convinced by his second theory of “cross-infection from animal to man” saying that there was no example of “ovine or caprine illnesses similar to woolsorters’ disease.” It should be noted, though, that in 1878, Bell’s second theory did not take into account anthrax nor micro-organisms. He considered the illness to be the result of “septicaemia due to the inhalation of a septic poison produced by the decomposition of animal matter.” Bell suggested removal or disinfection of questionable bales to help prevent woolsorters’ disease.46

Other scientists in the field generally supported Bell’s claim, but there was some division among them about Bell’s description of woolsorters’ disease as being an infectious disease. A year later, Bell inoculated animals with blood taken from individuals who had died from woolsorters’ disease. Within a short time, all of the animals had died. In samples of blood taken from the dead animals, Bell was able to locate and identify anthrax bacillus. After several repeated experiments, he declared that woolsorters’ disease and anthrax in animals were caused by anthrax bacillus.47 By 1879, Koch had already found that “Bacillus anthracis is the actual cause and contagium of anthrax,” but Bell made the connection between woolsorters’ disease and anthrax.

In Europe at this time, Koch’s germ theory was beginning to gain widespread support. In 1880, two years after giving his paper to the BMCS, Bell gave another paper to

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47 Cunningham, “The Work of Two Scottish Medical Graduates in the Control of Woolsorters' Disease,” 170.
update his opinions to reflect his support of Koch and Pasteur’s findings. Bell admitted his fault in claiming that woolsorters’ disease was due to septic poison in the dust and animal material. He also informed the BMCS “that the poison of woolsorters’ disease was the same as that inducing splenic fever and anthrax or malignant pustule in animals and that the infective agent was a bacillus called the Bacillus anthracis.”

Bell’s willingness to adjust his findings in accordance with the work of Koch and Pasteur demonstrates a number of aspects about Bell himself. First, and perhaps most importantly, it shows that Bell was up-to-date with cutting edge science and medicine. He was reading the journals of the day and reacting to what he read. He was also publishing his findings. Bell was not just a rural doctor stuck in his town and unable to see the world outside of Bradford and Leeds. This adjustment of his opinions shows that he was an active member of the scientific and medical community, and took great care to stay informed of advancements across Europe. Koch’s Postulates and Pasteur’s vaccines were not information localized to their respective European homes; scientists and physicians all over Europe and Great Britain were aware of their discoveries. The fields of science and medicine had become sprawling communities that reached all parts of Europe.

Along with being an active member of the scientific and medical scene, Bell was a community practitioner. He had a sincere interest in the people of his community and was a hands-on physician who interacted closely with his patients. His community-oriented nature shows why, on May 6, 1880, Bell was greatly concerned when one of his patients, a man by the name of Samuel Firth, contracted woolsorters’ disease and passed away. Being Firth’s head physician, Bell completed the death certificate stating that Firth had died of

woolsorters’ disease because of “his employer’s neglect in not having the mohair he [Firth] was sorting disinfected beforehand.”

As imaginable, Firth’s death and Bell’s comments about it created quite a public stir. As a result, the coroner’s jury issued precautions that touched on three topics: wool handling, workplace cleanliness, and personal hygiene. These regulations, however, were not legally binding and were as follows:

**Wool handling:** Before a bale is opened, it must be steeped in salt water for no less than 12 hours.

**Wool handling:** The bale must then be washed in hot water (temperature no less than 120°F), sent through rollers, rewashed in hot water, partial dried, and sorted while damp.

**Workplace cleanliness:** The sorting room must be well ventilated, the floor swept daily, the walls and ceiling swept monthly. The walls must also be whitewashed every six months. No hair or wool may be stored in the sorting room. No food may be eaten or stored in the sorting room.

**Personal hygiene:** Sorters must have wash stations made available near the sorting room.

These regulations became known as the Bradford Rules. They also provided for a reporting law that helped compile information about anthrax cases in the area.

In the same month as Samuel Firth’s death, John Spears, a local government board inspector, toured the mills in Bradford looking for a way to reduce the amount of foreign

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infectious agents mill workers came in contact with. His report noted the lack of care taken to disinfect and/or remove fleeces and hair from “fallen fleeces”\textsuperscript{52} that were imported. In his research on the deaths of woolsorters in Leicester, Spears traced the fallen fleeces to a shipment from China. From his work, Spears created a listing of certain places in the world whose raw products where commonly known to harbor infectious agents. Unfortunately, Spears, like the coroner’s jury, possessed no authority to make his recommendations legally binding about what was and was not imported.

Bell was able to achieve some success with non-binding regulations. In 1884, after the death of another woolsorter, the public held a health conference to add more provisions to the 1880 Bradford Rules. As factories began to voluntarily adopt the changes, the number of industrial anthrax cases began to decline. This decline marks the end of the standard triumph narrative. Bell’s work gained wider notice in England and factory owners were voluntarily offering to help end the anthrax problem for wool workers.

It was not, however, until a few years later that some of the first legally binding legislation was issued: the 1891 Factory and Workshop Act. This act gave the government, with the aid of the factory inspectorate, to power to create regulations for industries that handled materials that could potentially harm workers. Although anthrax was not specifically included, the governmental committees performed investigations to determine the relative threat of anthrax. Additional regulations were drawn up that were similar to the voluntarily 1880 Bradford Rules. In 1895, the Factory and Workshop Act was reissued to include several

occupational diseases by name, including anthrax, lead, arsenic, and phosphorus that were required by law to be reported to the appropriate official. Anthrax was the only bacterial disease included.\(^{53}\)

There were still a number of cases in Bradford, England in the late 1800s after the Factory and Workshop Act of 1895. Thompson reported that “during a period of several years, 71 cases of anthrax developed in the woollen industry, with 24 deaths, of which 15 were internal and 9 external in type.”\(^{54}\) Anthrax cases numbers were lower with the recommendations from new legislation, but there were still a noticeable amount of deaths occurring.

Other research was being done during this time to discover other traits of anthrax, such as the possibility of its contagiousness via water. In 1893, Percy Frankland brought a second report to the Royal Society of London entitled “Second Report to the Royal Society Water Research Committee. The Vitality and Virulence of Bacillus Anthracis and Its Spores in Potable Waters.” In his lengthy report, Frankland puts the society’s mind at ease by showing that anthrax is not a disease that is carried via water, such as cholera.\(^{55}\) Cholera was an immense problem in London at the time, and the scientific and medical world had great concern that anthrax was another disease that could infect people via their drinking water.

Bell continued his work into the twentieth century, and in 1905 he co-authored a piece about industrial anthrax with Sir Thomas Legge in Allbutt and Rolleston’s *The System*


\(^{54}\) William Gilman Thompson, *The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention* (New York: D. Appleton, 1914), 453.

of Medicine. The following year, Bell passed away and left the continuation of his work to Frederick W. Eurich. Eurich, like Bell, grew up in a community surrounded by the textile industry and woolsorters’ disease. He went to school at Edinburgh University to study medicine, and in 1896 founded his practice in Bradford. In 1905, the Chamber of Commerce in Bradford created the Anthrax Investigation Board and asked Eurich to preside as its first district bacteriologist and director. The Anthrax Investigation Board’s goal was to research the anthrax problem in the textile industry and find solutions that did not favor the employers over the employees or vice versa.

Eurich’s greatest contribution to the study of industrial anthrax was his research on sterilization methods of wool before it reached the woolworkers. He first tried boiling potentially infected wool and found that the process killed all of the bacteria but not all of the spores. Boiling also damaged the wool quality. Also, while general boiling treated large amounts of the wool, it did not treat every individual wool strand. Later, he used microscopic techniques to determine that the blood attached to the strands of wool harbored the spores. Despite this crucial finding, no new legislation was created to regulate the handling of wool with blood attached to it. In fact, in 1910, a large group of the Anthrax Investigation Board resigned because of the lack of practical solutions to the anthrax problem. At this time, there was little difference in the number of fatal cases of industrial anthrax when compared to the rate of cases in 1896.

Eurich continued to research sterilization methods for raw wool, and in 1914, with the help of Elmhirst Duckering, another member of the Anthrax Investigation Board, the Duckering Process was developed. The Duckering Process was meant to reduce the number
of spores in wool to a level below what was considered infectious while not destroying the quality of the wool. The Duckering Process is performed “by bathing wool successively in troughs filled with solutions of sodium carbonate and of sodium hydroxide (lye) then immersing it in hot (100 degrees Fahrenheit) formaldehyde.” Duckering was exceedingly successful in reducing the number of anthrax cases in woolworkers, and his process soon became a common method of raw wool sterilization in England.56

Eurich’s research and publications on industrial anthrax continued into the 1930s. He had taken up Bell’s work and helped connect the scientific and medical research with the government realm with his work on raw wool sterilization. As a result, Eurich aided in the passage of legislation mandating the sterilization of suspicious wool, that Bell had sought to have created for so many years. Even though Eurich continued the unfinished work of Bell, the triumphal narrative typically omits Eurich and ends after Bell was able to get some non-binding regulations established. Bell was the great hero of the anthrax problem and his work ‘solved’ much of the mystery surrounding the deaths of wool workers. So, it is in the 1880s that the anthrax problem is ‘conquered’ according to standard triumphal narratives.

But the Koch, Pasteur, and Bell narrative is incomplete. It addresses only the advances made by bacteriology in the 1880s and disregards the fact that anthrax in humans originated as an occupational disorder years before the bacteriology triumphal narrative, and human anthrax remained an occupation disease story for decades afterwards. The next chapter will examine the industrial nature of human anthrax that is too often omitted from the standard triumphal narrative.

CHAPTER 2: AFTER THE TRIUMPHAL NARRATIVE

The point of triumphal narratives of disease is the ‘conquest,’ told in support of a progressive advance of scientific medicine. These stories are told in textbooks and are immortalized in paintings on physicians’ office walls. They are easy to remember, and the hero always conquers his foes. These narratives are very satisfying for the public. Diseases caused by exposure to wool and hair did not terrify the public like diseases involving lead. There were far fewer cases of anthrax as compared to lead poisoning. Also in the twentieth century, the wool industry became displaced by other larger industries. The alarm associated with wool diseases was diminished because of the preventative measures available in mills. These facts aid in covering up the lack of a cure for anthrax. The numbers of anthrax deaths in no way violated the public’s sense of personal safety, and therefore, the public was satisfied with what was being done regardless of the fact that there was no cure, much less a vaccine. That is to say that people were not afraid of dying from anthrax; therefore, they were happy with the little progress physicians had made. The medical world had taken anthrax out of the realm of occupational disease and health, ‘conquered’ it in a triumphal manner, and returned it to its original status of industrial issue still with no cure or realistic treatment.

Though all triumphal narratives are by nature satisfying, there are different types of triumphal stories. One kind is the triumphal narrative of treatment and cure where a physician devises a novel treatment or cure that revolutionizes the handling of a horrid disease. Smallpox is a prime example of a triumphal narrative about the conquest of disease via a cure or treatment. Smallpox killed hundreds of thousands of people before a treatment was created. But once a standard vaccine was widely used, smallpox was wiped out as a deadly disease even in the third world. But anthrax is not a triumphal story about treatments
and cures. It is a triumphal narrative about the discovery of a cause of disease. No hero in the anthrax triumphal story devised a definitive treatment or cure for anthrax. Koch and Pasteur did, however, isolate the particular bacteria that caused anthrax and Bell used that knowledge to make a connection to the wool industry. These men took a frightening and deadly disease from the realm of unknown threat to disease with a certain and definite cause. The next step in a triumphal story of discovery of cause is to move the handling of the disease from the physicians and scientists to mill management and social reformers. From there, preventative methods are fine-tuned and are enforced in a more standard way. As a result, the overall number of cases decreases. But it is precisely this shift from science to management that successfully covers up the fact that there is still no cure.

Robert Koch, Louis Pasteur, and John Henry Bell, and their work make up the triumphal narrative of human anthrax. All was well: a treatment was devised; a prevention method was created and implemented. The anthrax story is over, wrapped up in a neat little package. Right? Actually, not at all. Human anthrax was an occupational disease centuries before it became a bacteriological issue and it remained an industrial issue long after the bacteriological profession had deemed human anthrax solved.

**Industrial Health and Disease**

In the realm of industrial health, industrial hazards can be broken down into two distinct categories: industrial diseases and industrial injuries or accidents. The second category has always been more easily defined, and therefore, it was the first of the two to gain enough attention to call for scientific studies and legislation. Injuries and accidents were clearly distinguishable from industrial diseases, especially to the everyday person. If a worker’s hand got caught in a machine and cut off, the injury is clearly defined as a severed
hand. The worker’s injury has a defined limit and is non-progressive. It is also easy to
determine whether or not the injury will affect the ability for future work. It is harder to
clearly define industrial diseases because their causes are not always easily discernible and
there may be no clear limit to the disease.\textsuperscript{57} According to William Thompson,\textsuperscript{58} the definition
of occupational diseases are “maladies due to specific poisons, mechanical irritants, physical
and mental strain, or faulty environment, resulting from specific conditions of labor.”\textsuperscript{59}

A review of Thompson’s treatise in 1914, asserted that his work “is at once an
indication of the interest which enlightened American physicians are beginning to take in
[occupational diseases], and a notable contribution to the campaign for industrial hygiene in
which [Thompson] has been a valued leader.” The reviewer goes on to say that the United
States had only just begun to appreciate the study of occupational diseases in 1914.\textsuperscript{60} The
concern for, study, and classification of occupational health in the United States was a novel
interest at the beginning of the twentieth century as opposed to the 1880s when Koch and
Pasteur did their major research.

In some histories of occupational disease, authors choose to include Bernardino
Ramazzini, who is said to be one of the first to study occupational diseases.\textsuperscript{61} Ramazzini is

\textsuperscript{57} Thompson, The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention, 48.
\textsuperscript{58} William Gilman Thompson was a professor of medicine at Cornell University Medical College in 1914 when
he published his well known work, The Occupational Diseases; Their Causation, Symptoms, Treatment and
Prevention. His work is primarily a statement about the condition of occupational health and disease as it stands
in 1914 and provides very little history on the topic.
\textsuperscript{59} Thompson, The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention, 1.
\textsuperscript{60} Henry R. Seager, Political Science Quarterly 29, no. 3 (Sep., 1914): 536-7.
\textsuperscript{61} In 1999, two hundred and eighty-five years after Ramazzini's death, The Lancet published a triumphal article
about his work with occupational diseases, the subsequent fame of his treatise De Morbis Artificum Diatriba,
and how his work is still pertinent in present times. The article even includes a picture of the title page of De
Morbis Artificum Diatriba. Giuliano Franco, “Ramazzini and Workers' Health,” The Lancet 354 (September 4,
considered by Donald Hunter\textsuperscript{62} to be the Father of Occupational Medicine. He published the first edition of his now immortal work, \textit{De Morbis Artificum Diatriba}, in 1700 at the age of sixty-seven. \textit{De Morbis Artificum Diatriba}, the first treatise on the subject of occupational diseases, translates from the Latin as “The Diseases of Workers.” In his work, Ramazzini becomes the first scholar to explore the notion of diseases being specific to particular types of workers. Ramazzini’s work in occupational diseases has been deemed as great as Vesalius’s work on anatomy, \textit{De Fabrica Humani Corporis}, and Harvey’s work on physiology, \textit{De Motu Cordis}.

During the Industrial Revolution, the center of activity for occupational medicine and diseases shifted to England, specifically in the West Riding district of Yorkshire and Lancashire. Ramazzini had asked his patients what their occupations were because he had connected the nature of many trades as the causes of workers’ injuries and made many excellent observations about the nature of workers and their environments. But English physicians helped spawn a new branch of medicine. England was one of the first industrialized nations; it was also one of the first to have reformers and physicians take a serious look at industrial health issues including quantification, measurement, and documentation of the effects of industrialism on the lives of the English working class. In the beginning, occupational diseases were associated with factors including race, ethnicity, and life at home.

\textsuperscript{62} Donald Hunter was a physician who, like Thompson, is well known for the textbook style treatises he wrote on occupational health and diseases first published in the 1950s with as many as six editions. His work has the tendency to tell a triumphal story about occupational health and diseases beginning with a history of “Man and His Work” and the Industrial Revolution. He also includes a lengthy section on Ramazzini who he deemed “the Father of Occupational Medicine.” Excluding the introductory chapters, Hunter's and Thompson's are similar in their addressing of a variety of occupational health hazards and diseases ranging from metals to toxic gases to infectious diseases (although they make use of terminology relative to their own times).
One of the early prominent figures in England working on occupational diseases in the early 1800s was Charles Turner Thackrah, who practiced in Leeds. The origin of his interest in occupational health is not entirely known, though Hunter speculates that during Thackrah’s apprenticeship, he came in contact with Robert Owen while Owen was studying factory conditions in Leeds. It is known, however, that Thackrah’s immediate teacher, Sir Astley Cooper, inspired much of his work before Thackrah left London to practice in Leeds. Thackrah’s primary work on occupational health, *The Effects of the Principal Arts, Trades and Professions, and of Civic States and Habits of Living, on Health and Longevity, with Suggestions for the Removal of many of the Agents which produce Disease and shorten the Duration of Life*, published in 1832, was one of the first of its kind to be written in England.

Though his work covers factory operatives, shop-keepers, merchants, and professional men, Thackrah devotes the largest section to the operatives. One of Thackrah’s greatest concerns for workers was their ability to take in fresh air and get exercise while on the job. He says of husbandmen:

> Husbandmen stand at the head of this division. Spending the day in the open air of the country, and in labour varied and good, they are well known to be generally healthy. Though exposed in many parts of their employment to the vicissitudes of the weather, they seldom suffer serious injury. The dyspeptic and nervous disorders, and the long train of chronic maladies so frequent in towns, are almost unknown in the country.

Thackrah claimed that this general good health to be the result of a profession that required exercise and many opportunities to take in fresh air. Butchers, cooperers, fishmongers, cattle and horse dealers, and carpenters, in Thackrah’s opinion, were very healthy professions. Each allowed workers plenty of exercise and was in an open atmosphere. He does say,
however, that some professions in open atmospheres were prone to drinking which ruined the positive results of their professions’ exercise and fresh air.

Thackrah went on to describe the opposite of the above professions as “the employments...carried on in an atmosphere confined and impure.” Large cities were in, as Thackrah called it, “an unnatural state.” The gases and waste put off by factories and city life were harmful to the cities inhabitants, and Thackrah wondered if even 10% of cities dwellers were able to enjoy complete health. Afflictions in the lungs, digestive systems, and nerves plagued those living in cities, especially infants. These atmosphere toxins were far greater for those who both lived and worked in crowded spaces with very little ventilation. Stale air in the living and working environments as well as the lack of movement that most likely accompanied small spaces took a toll on a person’s health. Thackrah used tailors as his key example of cramped professions:

Tailors are very unfortunately situated in this respect. Sitting all day in a confined atmosphere, and often in a room too crowded, with the legs crossed and the spine bowed, they cannot have respiration, circulation, or digestion well preformed. The employment, we must admit, produces few acute diseases. But disorders of the stomach and bowels are general, and often obstinate. Pulmonary consumption is also frequent. Some of the men state their liability to pains of the chest; but the majority make no complaint. It is nevertheless apparent, even from observing only the expression of countenance, the complexion, and the gait, that the functions of the stomach and the heart are greatly impaired, evening those who consider themselves well. We see no plump and rosy tailors; none of fine form and strong muscle.65

The unnatural human form maintained for twelve to fourteen hours did not provide adequate space for internal organs to function properly. Thackrah believed that even though one might be able to medical diagnosis the internal organ weaknesses in tailors, the weaknesses were nevertheless present and visible in many tailors’ outward appearances. Stay-makers,

65 Thackrah. The Effects of Arts, Trades, and Professions on Health and Longevity, 73.
dressmakers, shoemakers, and weavers were also subject to similar internal organ maladies as tailors.

Even though they were not factory or similar laborers, Thackrah drew on the similarities in health problems of professional men, like lawyers, clerks, and students, who worked their minds more than their bodies. “The profession of the law, in most of its branches, is sedentary. Solicitors’ and other clerks are kept, from morning to night, in a bad position, with the limbs fixed, and the trunk bent forward.” But Thackrah provides advice on how to alleviate many of the common health problems. His most common advice: “the simple and effectual remedies, fresh air, and full muscular exercise.”

The medical field, the public, and the government quickly noticed Thackrah’s work, and the attention helped to set in motion the necessary steps for social reforms, such as managing the number of hours in which children could work. Unfortunately, Thackrah died in 1833, at the age of thirty-seven from tuberculosis. Many believed that his death was a devastating blow to the progress of occupational health reform. Sir Thomas Legge wrote of him:

I believe that Thackrah’s early death retarded the progress of industrial medicine and surgery and the amelioration of conditions of employment for half a century. Had he lived his clinical knowledge and experience would have given prominence in legislation to the need for medical supervision in the factory and workshop...

It was in the year of Thackrah’s death that The Factory Act of 1833 was passed by Parliament. There were earlier Factory Acts in 1819 and 1825, but they were shorter laws

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66 Thackrah. The Effects of Arts, Trades, and Professions on Health and Longevity, 71, 179, and 176.
68 Sir Thomas Legge was the first Medical Inspector of Factories in 1898. He worked to create better prevention methods for occupational diseases in a variety of workplaces. While in office, he became one of the leading experts on lead poisoning and anthrax. T. Waldron, “Thomas Morison Legge (1863-1932): The First Medical Factory Inspector,” Journal of Medical Biography 12, no. 4 (Nov, 2004): 202-209.
69 Hunter, The Diseases of Occupations, 126.
that were not as effective as the Factory Act of 1833 in addressing the health of workers. The focus of these previous acts was the conditions and hours for working women and children. The health of workers was not a main focus of any of the Factory Acts in the early 1800s.70 The most important aspect of the Factory Act of 1833, which had not been included in the previous Factory Acts of 1819 and 1825, was the establishment of a Factory Inspectorate. The Factory Inspectorate’s role was to oversee the enforcement of the Act’s provisions about hours and conditions. The first four inspectors were Leonard Horner, Thomas J. Howell, Robert Rickards, and Robert J. Saunders. These four men had the right to enter any workplace covered by the Act, prosecute owners, and set up and maintain factory schools that taught children employees. The men inspected many of the factories and personally witnessed the horrible conditions in almost all of the trades. The overwhelming conclusion of their factory reports was the need for further government legislation to regulate the workplaces in regards to workers’ safety and health on the job.71 Other Factory Acts followed the Factory Act of 1833 until the Factory Act of 1878 consolidated all of the Factory Acts into one larger law.72 But these laws focused more on the treatment of women and children and less on disease control.

In the nineteenth century, physicians, like Thackrah from earlier years, noticed the relationship between their patients’ health and occupations, and some began to address the problem in a more public manner. There is a distinct pattern in the process physicians used

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70 Marjie Bloy, “Factory Legislation 1802-1878,” The Peel Web. http://www.historyhome.co.uk/peel/factmine/factleg.htm. Bloy earned her PhD in 1986 from the University of Sheffield and her M.Ed. in 2000 also from the University of Sheffield. Her website was a component of her M.Ed. project and concerns the “Age of Peel,” British history between 1830 and 1850. She is currently working to extend the time period to include 1760-1830.
to make patients’ illnesses more public. First, when workers became ill, physicians started to wonder and look closer at the conditions both at home and at work. Then, they often made recommendations to companies about improving work conditions. Only after physicians made their recommendations did the government get involved.

In the 1800s, the process did not always involve science. Physicians used observational skills to make judgments about workplaces and then made efforts to clean the workplaces based on their judgments. For example, they knew that dust was bad for lungs, so the physicians sought to create a less dusty atmosphere. An example of a disease caused by dusty working conditions was black lung disease in the coal mining industry. Black lung disease is a condition that coal miners acquired after years of working in the mine. This atmosphere “clogged-up” the miners’ lungs and lead to their untimely deaths. Physicians noticed that their patients who worked in the mine coughed up a thick black substance and were constantly breathless even when not physically exerting themselves. Physicians then made the connection between the deterioration of the miners’ lungs and the enormous amounts of dust the miners breathed in every day in the mine, and began to pursue changes in the industry, such as installing newer and better ventilation systems, to make the atmosphere less dusty.  

74 With the increasing need for coal to power trains, heat homes, and run factories, more men and boys were employed as miners. But despite the industrialization of many aspects of labor, mining techniques remained preindustrial. Miners still used pick axes to remove coal from the walls of mines, and “every stroke of the pick dislodges a fresh shower of dust, to be inhaled by the miner.” To add to the problem, using a pick ax was a physical job that increased the rate of respiration which, in turn, increased the amount of dust the miners inhaled. When augers were brought in to speed production, the result was even more dust being released into the air. There was nowhere below the surface of the earth where a miner did not breathe in dust. There were ventilation systems consisting of fans and blowers, but most companies found them too expensive. A journalist in the 1870s noted, “The wonder is not that men die of clogged-up lungs, but that they manage to exist so long in an atmosphere which seems to contain at least fifty per cent of solid matter.” However, it was not until 1969
The study of occupation health and diseases in the nineteenth century had begun to develop into a recognized field of medical study called occupational medicine. In the late nineteenth century, many industries had diseases associated with their workers’ occupations, and physicians worked to have their patients’ ailments acknowledged by the government as having an occupational cause. As more diseases in different industries were taken seriously, physicians studying these new diseases were able to make progress in obtaining public acknowledgment for their patients as well. The diseases of the textile industry were among those diseases addressed in the developing field of occupational medicine. Until the early 1900s, the majority of the scholarly work on occupational diseases, including anthrax, was done in Europe. England, German, France, and Italy were at the forefront and led the field of occupational disease study for many years. This interest in occupational health grew as new industrial processes developed in the nineteenth century.

**Wool and Hair Manufacturing**

In the first steps of textile manufacturing, raw wool or hair was gathered from farms, baled, and shipped to textile mills. When the raw products were unloaded into the mill, the first workers they came into contact with were the woolsorters. The woolsorters opened the bales, spread them out over tables, and sorted each piece of wool or hair “according to

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that the United States government took steps to prevent black lung diseases when Congress forced mining companies to sign agreements to change their ways. In the Federal Coal Mine Health and Safety Act of 1969, the number of federal inspections of mines was increased, new health standards were adopted, and safety regulations were strengthened. The Act also provided disability benefits to the victims and their families. Mine Safety and Health Administration (MSHA), “History of Mine Safety and Health Legislation,” http://www.msha.gov/MSHAINFO/MSHAINF2.HTM.

75 Woolsorters used specialized tables that had a grid over the top and allowed dust and dirt to fall through the grid. There were also specialized tables that used fans to pull air through the wool or hair and draw the dust out of the raw materials and the room. Werner Von Bergen and Herbert R. Mauersberger, *American Wool Handbook; a Practical Text and Reference Book for the Entire Wool Industry*, 2d enl. ed. (New York: Textile Book Publishers, 1948) 390-1.; *The Wool Year Book*, (Manchester, England: Marsden and Co., 1909), 99.
length, fineness, soundness, and colour.” The raw material was then scoured to remove any remaining grease, sand, or dirt, and afterwards, it was thoroughly dried via hot air or centripetal force. At this point in the manufacturing process, one of two departments took raw materials. If the wool or hair was short, it was sent to the carding department. If it was longer, the wool or hair went to the combing department. The carding and combing departments both performed the task of breaking up the natural clumps and brushing the wool or hair into a long continuous rope to be sent to the spinning department. When the wool or hair reached the spinning department, it was spun into thread then sent to the weaving department where it was woven into cloth.

As an infectious disease, industrial anthrax is contracted by coming into contact with anthrax spore infected raw materials, such as wool, hair, and hides. This close association between anthrax and raw materials put textile mill workers in especially compromising occupations. Every day they handled raw wool, hair, and hides. They were potentially able to become infected by spores entering their bodies via preexisting lesions in their skins, no matter how small or insignificant, as well as breathing spore-filled air. Workers were even cautioned to be wary of even a hangnail: “Tanners and wool sorters, in handling foreign skins

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76 In European countries, the training of sorters was much more extensive as compared to the United States. Europeans sorters were required to undergo a four-year apprenticeship program. There were two kinds of sorting: bench sorting and trap sorting. In bench sorting, the sorter performed all aspects of the sorting process. An individual sorter opened the bale and sorted the entire bale by himself. This was a highly-skilled although very time-consuming job. The second form was trap sorting; seventy-five percent of wool was trap-sorted in the United States. Two workers opened bales, one worker sorted the wool, and a fourth worker checked the third man’s work. This method was far quicker and cost-effective than bench-sorting. Werner Von Bergen and Herbert R. Mauersberger, American Wool Handbook; a Practical Text and Reference Book for the Entire Wool Industry, 2d enl. ed. (New York: Textile Book Publishers, 1948), 389, 390-1, 395-6.


78 The Wool Year Book, 103, 118, 139, and 132.
or wool, should not carry them upon the unprotected shoulder, and should guard against exposure from any cuts or scratches or ‘hangnails.’”79

This reference to “foreign skins or wool” came during the height of global imperialism in late nineteenth century. Countries such as England, France, and Germany had outlying colonies that offered new raw material sources. This included different species of domesticated goats and sheep not found in Europe, as well as new species like camel and alpaca. In the late 1800s, foreign imported raw hair and wool was viewed as highly suspicious, unlike domestic products. The home countries were aware of the discrepancy between domestic and foreign products and sought was in which to alleviate the problem. Much as this responsibility fell on the farmers in colonies. For example, anthrax in livestock had become a serious problem in South Africa during the late nineteenth and early twentieth century. As a result, lawmakers passed the South African Stock Disease Act of 1911 required farmers to report all “suspicious deaths” to veterinary officials. Along with mandatory reporting, farmers also had to submit a blood sample taken from the deceased animal’s ear for testing. In the 1920s, South African Department of Agriculture officials were still concerned with the anthrax problem in their country. At the threat of exportation restrictions, the government enforced mandatory vaccinations of livestock.80

But despite best efforts, infected wool, hair, and hides were still imported into England, and what was once a healthy occupation was no longer viewed as such. John Henry Bell noted that sorting was an extremely healthy occupation before mohair was imported in

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79 Thompson, *The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention*, 457.
England.⁸¹ Frederick Eurich wrote in *The Lancet* in 1926 that “Hitherto Van mohair had received almost all the blame…All average mohair, Cape mohair, peliton, and alpaca are to be sorted as usual while Van mohair, camel-hair, and Persian wool are to be considered noxious and dealt with.”⁸² Even as late as 1905, a note in a piece of British wool legislation regarding the handling of imported raw materials stated:

In this country and Australia anthrax is rare, consequently there is little danger in handling wools from the sheep of these two countries, but in China, Persia, Turkey, Russia, the East Indies, and in many other parts of the world, the disease is common, and infected fleeces or locks (which may not differ from others in appearance) are often shipped to Great Britain.⁸³

Many cases of anthrax were traced back to these foreign raw materials.

Some occupations in the mill were more prone to contracting anthrax than others. The occupations at the beginning of the manufacturing process, such as the woolsorters, carders, and combers, were far more likely to contract anthrax than those who were employed in the later stages, such as the weavers. That is not to say that weavers never contracted anthrax. They were just far less likely to do so since the raw material had been handled heavily before it reached them. The greater chances of contracting anthrax at the front of the manufacturing process perhaps provided one of the synonyms of anthrax: woolsorters’ disease.

Most of the research performed had been done to study anthrax in an occupational setting. Collective works on industrial diseases and disorders can provide insight into the positioning on occupational anthrax in different periods in history. In 1914, Thompson devoted a large section of his comprehensive work on occupational diseases into diseases due to irritant substances. In this section, Thompson further divided the topic into diseases caused

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⁸¹ Cunningham, “The Work of Two Scottish Medical Graduates in the Control of Woolsorters' Disease,” 170.
⁸³ Thompson, *The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention*, 454.
by metals, gases, fluids, dusts/fibers, germs and miscellaneous irritants. Anthrax is located in the Germs section flanked by Hookworm Disease, Foot and Mouth Disease, Glanders, and Septicemia. All of the other disease categories have at least 15 specific examples, but the germs section listed only those five afore mentioned diseases.\footnote{Thompson, \textit{The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention}, x-xiv.} The majority of the industrial diseases known during Thompson’s time were not germ-based.

In 1978, Donald Hunter released his comprehensive work on occupational diseases. His categorization is slightly different than Thompson’s in that he divided the sections by metals, gases, carbon compounds, infections, skin diseases/cancers, pneumoconioses, and accidents. Anthrax falls into the category of occupational diseases due to infections and is joined once again by Glanders and Hookworm, but Hunter also added Weil’s Disease, Erysipeloid of Rosenbach, and Cysticercosis. He also included a section on general infections that result from contact with animals. Though sixty-four years after Thompson’s work, Hunter, like Thompson, included far more diseases caused by non-infectious means than infectious means.\footnote{Hunter, \textit{The Diseases of Occupations}, xvi-xxii.} This could mean that diseases from sources such as metal or dust are more common than infectious diseases. It might also mean that physicians are less able to correlate infectious diseases to an industrial process.

\textbf{Public Education and Legislation}

But physicians were not the only ones researching industrial anthrax, or other occupational diseases for that matter. Several European cities created public institutions dedicated to industrial disease education, treatment, and study. Europe’s fourteen largest cities established Industrial Museums of Safety that were supported by their national
governments. The Berlin Museum of Safety and the Vienna Museum of Safety were founded in 1904 and 1909, respectively. These Museums of Safety featured charts and pictures of occupational diseases and were dedicated to the education of the general public about industrial hazards and diseases. With a more substantial education in possible occupational hazards, workers could become more aware of the dangers they face on the job and ways to avoid such dangers.

The British Parliament also classified certain occupational diseases and accidents as worthy of compensation under the Workmen’s Compensation Act of 1906. Originally, only six diseases were named, including lead and phosphorus poisoning. By 1914, that number had risen to twenty-four. One of the key players in this achievement was Sir Thomas Oliver, who performed Parliamentary investigations and worked to make laws compelling physicians to notify the government about certain industrial diseases. His focus was on lead poisoning, phosphorus poisoning, textile diseases, and diseases of other commonly dusty trades. The British Compulsory Notification Act was passed in 1908 and workers began earning compensation for their illnesses. During that year, four hundred twenty-one cases of lead poisoning and twenty-three cases of anthrax were reported.

The United States followed the lead of European developments after a lag of a few years. The United States government did not sponsor national studies on occupational diseases, nor did the Congress pass any legislation in regards to prevention or compensation until several years after European countries. Several of the states, however, did create exhibits on industrial hazards that were similar to the European Museums of Safety. In 1907, the Massachusetts State Board of Health displayed an exhibit in Boston that featured ninety
pictures of industrial hazards. New York City also established its own small Museum of Safety.

By 1914, Illinois, Massachusetts, Minnesota, New Jersey, New York, Ohio, and Wisconsin collected industrial disease photographs and created educational exhibits for the public. Illinois and New York also created special committees at the state level for studying occupational diseases. Of all the states, Connecticut, Illinois, Massachusetts, Minnesota, New Jersey, New York, and Wisconsin most actively gathered data on industrial diseases. But, it was really not until 1910 that the United States federal government began to become active in the field of industrial diseases.

One of the first actions on the part of the United States was the United States Bureau of Labor’s Bulletin No. 86 in 1910. The Bulletins published by the U.S. Bureau of Labor are government issued pamphlets that are published numerous times each year and discuss various subjects related to labor. Potential topics included but are not limited to wages, strikes, workplace conditions, and diseases. Bulletin No. 86 included a list of industrial poisons prepared for the International Association for Labor Legislation and compiled by Dr. Thomas Sommerfeld, Sir Thomas Oliver, and Dr. Felix Putzeys. The list was later republished as Bulletin No. 100 in 1912. The United States Census Bureau also issued a partial classification of one hundred and one industrial diseases.86

There was also the formation of the National Conference on Industrial Diseases, which had its first meeting in Chicago in 1910. During its first meeting, conference members drafted a letter to President Taft informing him of the 13.4 million annual cases of industrial diseases. They estimated that the economic losses due to illnesses totaled around three-

86 Thompson, *The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention*, 3-7.
fourths of a billion dollars each year. For the conference’s second meeting in June of 1912, they held a meeting under the sponsorship of the American Association for Labor Legislation. There was also a joint meeting with the American Medical Association’s Section on Hygiene and Public Health. This meeting had several discussion panels that provided important information about the various aspects of industrial diseases. The meeting also featured an exhibit that was presented in conjunction with the New York State Factory Commission and included pictures and diagrams of dangerous trades. Other organizations formed committees as well. Science-based organizations such as the New York Academy of Economic and Social Science and the New York branch of the American Chemistry Society formed committees to begin active discussions about occupational diseases.

A number of individuals in the United States stand out for their particular studies: Dr. Alice Hamilton and her work in lead poisoning; Mrs. Lindon W. Bates and her work with mercury in the felt hat industry; Dr. Emery R. Hayhurst and his work with brass poisoning; Dr. W.C. Hanson and his work with the dusty trades; Dr. Graham Rogers and his work with pottersies, bakeries, calico printing, and cloak making; and Dr. John B. Andrews and his work with phosphorus and lead.

Many states also created compulsory reporting laws for certain occupational hazards. When the United States began to create their reporting laws on occupational disorders, it was done at a state-level and not a national level. Many of the states copied verbatim the English

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87 The American Association for Labor Legislation was a group co-founded by John R. Commons and John Andrews that “worked for protective labor legislation and social security laws at the state level, advised legislative committees, helped draft legislation, and published the American Labor Legislation Review.” In the first years of its journal, American Labor Legislation Review, articles gave as much attention to industrial diseases as to legal issues, such unemployment and wages, but after a few years, the journal slowly moved away from disease issues and focused more heavily on the legal issues. Wisconsin Historical Society, “American Association for Labor Legislation (AALL),” [http://www.wisconsinhistory.org/dictionary](http://www.wisconsinhistory.org/dictionary) and *American Labor Legislation Review*, vol. 1-10, (1911-1920).
reporting laws. It was in this way that anthrax reporting laws made their way to the United States between 1911 and 1915. Some states questioned the inclusion of anthrax since it was not a problem in some states, so anthrax was included in only some of these laws.

California and New York were two of the first to issue occupational diseases compulsory reporting laws in 1911. These laws provided that all physicians who treated a case from a list of specific occupational diseases must report the instance to the state government. Diseases that required reporting included “anthrax, compressed air illness, and poisoning from lead, phosphorus, arsenic or mercury, or their compounds.” Reports had to include the victims name, address, place of employment, the disease, and any other pertinent information. Depending on the specific rules of the state, reports were submitted to either the State Board of Health who transmitted it to the State Commissioner of Labor or directly to the State Commissioner of Labor. Other states followed: New Jersey in 1912 and Pennsylvania, New Hampshire, and Massachusetts in 1913 among several others. The following are two examples of cases reported to state authorities as published in No. 205 and 267 Bulletins published by the United States Bureau of Labor Statistics:

No. 105, of Endicott, N.Y., died at the age of 22, of June 1, 1015, of “septicemia; anthrax.” The deceased was employed in a leather factory unloading dry South American and Chinese hides. They were said to have been disinfected. Examination showed “infection on arm and neck, and swollen chest.” The hospital physician states that he “injected with 12 per cent carbolic acid and removed infected area.” No serum was given. The illness lasted two days. “Positive diagnosis was made after death by bacteriological test of blood and tissue of arm.”

No. 106, of Thompsonville, Conn., died at the age of 35, on June 7, 1915, of “anthrax infection; genuine anthrax; from initial ulceration on neck.” The anthrax organism was “diagnosed in smear and culture.” He was employed in a carpet factory. The physician at the Hartford hospital, where the patient was taken, states that there

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88 Thompson, The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention, 6-8 and 702-4.
was a “pustule on anterior neck, and edema...of anterior chest.” Serum was not available. The illness lasted six days.\textsuperscript{89}

There was an apparent increase in anthrax cases in the United States from 1915 to 1916,\textsuperscript{90} but this increase does not necessarily represent a true rise in the number of cases. Instead, the inflation of case numbers could be due to the increase in reported cases under the new reporting laws. It is also important to note that these laws were not national or federal laws. Each law was created at the state level, unlike the English national laws. The laws being created at a state level means that there were differences in reporting from state to state, including which occupational diseases had to be reported. For example, in New York, anthrax was on the list of occupational diseases that had to be reported to state government officials. However, in Wisconsin, anthrax was not included in the compulsory reporting laws,\textsuperscript{91} most likely because state officials did not see it as much of a potential threat as compared with lead. Some states deliberately omitted anthrax from their laws because it was not a problem for their particular area, but other states chose to include it even if anthrax was not a typical problem for their regions.

These reporting laws coincide with the notable movement known as the Progressive Era. This political movement’s most important years span the 1890s through the 1910s. Progressives sought expansion in business regulation and other domestic reforms because of a goal to improve the quality of life for Americans. This meant getting rid of corruption in city governments, improving living conditions in slums, and making businesses more accountable for their actions in regards to working conditions. It is the improvement in

\textsuperscript{91}Thompson, \textit{The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention}, 702-4.
working conditions that applies most to the anthrax story. Workers were still infected with anthrax spores in factories and the social reformers were trying to make a concerted effort to improve working conditions and devise improved treatments. It is no coincidence that anthrax was taken up by Progressive social reformers. Anthrax was one of several occupational diseases, including lead and phosphorus poisoning, that Progressives concerned themselves with in the early twentieth century. It was part of the Progressives’ classic pattern of social reformers noticing industrial hazards, becoming involved, and seeking legislation.

In the early twentieth century, John B. Andrews, a Progressive labor economist and social reformer, took up the cause of workers when he co-founded and became secretary for the American Association for Labor Legislation in 1906 with John R. Commons. One of Andrews’s top concerns was occupational disease reporting laws and other legislation. He was not a physician but he still championed the workers at risk of industry related diseases, including those at risk of anthrax in the wool, hair, and hide industries. Although Andrews was a frequent author for the *American Labor Legislation Review*, there was very little written about anthrax. Of the attention given to occupational diseases, lead and phosphorus poisoning were more commonly discussed.

In 1917, Andrews reported a startling increase in the number of illnesses and deaths from anthrax surrounding the years of 1915-1916 in Bulletin No. 205, “Anthrax as an Occupational Disease.”92 This increase was primarily seen in New York, Massachusetts, and

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92 This is the time period where the increase of anthrax cases could be attributed to the compulsory reporting laws that were also created during this time. Although, whatever the cause of the increase in cases, Andrews notes the increase with great concern and is surprised by the large number of cases regardless of whether they were reported in previous years or not.
Pennsylvania, but it was also noticed in seaports and tannery towns. Andrews goes on to state that in the United States, anthrax “has as yet been given less consideration, although legislation for the reporting of anthrax...is widespread.” This statement follows a paragraph on the progress that European nations have made in the study and prevention of anthrax. Andrews asserts that anthrax has not been given the consideration that it requires and the United States lags far behind other European nations in legislation (besides reporting laws), especially legislation for the prevention of anthrax. All in all, Bulletin No. 205 notes in extensive detail 132 deaths of individuals with anthrax. However, in 1920, Bulletin No. 205 was updated with new information in Bulletin No. 267. An unfortunate update was in the number of deaths attributed to anthrax. Just three years after the 1917 Bulletin, Andrews reports that the number of anthrax death reached 222. However, the text regarding the lagging position of the United States behind other European nations in regards to legislation was not modified at all. Every word in that particular section was precisely the same. Both editions also state that for every five lead poisoning deaths, there was one anthrax death. Anthrax may not have been as widespread as lead poisoning, but it was still a significant issue for workers in the textile industry.

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93 New York, Massachusetts, and Pennsylvania were large wool working states. Seaports were the first place where Americans came into contact with infected wool, and tannery towns handled the hides of animals infected with anthrax.
Andrews places the United States position in the legislation process in the Bulletins as well. He breaks the legislation process into three stages: 1.) reporting cases, 2.) prevention methods, and 3.) compensation. In the reporting section of the Bulletin, Andrews states that:

In the United States, as in most civilized countries, the value of reporting or notifying infectious diseases is generally recognized…Reporting of human anthrax is, nevertheless, a comparatively recent advance in this country, being required, even as late as July, 1911, in only seven States. But because of the growing frequency of anthrax, together with more lively interest in occupational as well as infectious diseases, reporting laws spread rapidly, and by January, 1916, anthrax had been made notifiable in the following 24 States and in Porto Rico:


Andrews went on to say that diseases must be reported to the local health care officer by the attending physician. If there was not a physician, then the reporting responsibility fell on to any person that was aware of the case. Some states went further in their laws stating that anthrax be reported as an occupational disease, “contracted as the result of the nature of the patient’s employment,” as well as an infectious disease. These cases were reported to the labor department as well as the health department.

Andrews asserted that the creation of reporting laws increased the number of known cases, thus revealing the current prevention methods to be inadequate, both in agriculture and in manufacturing. He went on to reiterate the fact that “the question of prevention of anthrax among industrial workers, which is the subject of extensive legislation in the leading countries of Europe, has so far received little attention in the United States. Not a single special factory workshop regulation for the safeguarding of employees against this disease

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has yet been enacted by any State.” There was legislation referring to the importation of “dangerous animal materials,” but this was scant because it addressed only hides and not hair, wool, or bristles.

In April of 1916, legislation was modified to state that “foreign hides which can not be certified by an American consul as coming from a district in which…anthrax is not prevalent” were free to be shipped. The only restriction to this modification was that bales of hair and wool must “have been whitewashed under consular supervision” and they were “subject to disinfection after arrival at destination in this country.” Raw materials potentially infected with anthrax spores were allowed to be freely shipped with the intention of disinfection when they arrived.

While this modification did provide some protection to tannery workers and those who handled the bales later in the manufacturing process, it did not protect the workers who transported the bales to the tanneries and factories. The information that was sent to the consuls was also not always complete and “some of these officers (consuls) have frankly stated that the regulations for the disinfection of hides were not and could not be enforced by them” This legislation was not sufficient and even those placed in charge of enforcing it recognized that they could do no such thing.

In the fall of 1916, the National Association of Tanners, realizing the faults of the legislation, began working with Federal authorities to create new regulations. These regulations prohibited the importation of any raw materials from animals affected with anthrax. It also set stricter guidelines for disinfection of hides coming from anthrax-infested areas by soaking in bichloride mercury solutions. These new regulations also included, for the first time, disinfection requirements for bones, hoofs, wool, and hair.
Lastly, Andrews addressed compensation for victims of occupational anthrax. Similarly to prevention methods, he stated:

While Great Britain, Germany, France, Holland, Italy, South Australia, and the Canadian Province of Ontario have for years been awarding such compensation, in the United States only one State is as yet acting consistently on this principle.\(^99\)

The “one State” that the quote referred to was Massachusetts, and its law covered “personal injury” instead of “personal injury by accident,” which is what the other states’ laws stated. This wording allowed the law to provide compensation for both accidents and occupational diseases. In the first three years of the law, thirty claims were made regarding anthrax and seventeen of those cases were awarded some compensation. Eighteen of the thirty cases were hide or skin workers. Transportation workers comprised nine of the claims. One of the transportation worker reported that he had been

Discharging buffalo hides from a steamship. I had been on this job four days when I got a scratch on my arm. The following day I notice something like a wart which was itchy. I finished the job and there was no work until August 5. I started to go to work on this day, but my arm was itchy and sore, and I went to the hospital instead, where they said I had anthrax and was operated on right away.”\(^100\)

The Massachusetts law provided monetary wage and medical compensation but the disability in question had to persist more than two weeks. Of the seventeen cases with compensation, amounts ranged from $2.57 (out of work for almost two and a half weeks) to $754.69 (out of work for over two years). Of the three cases filed posthumously by family members, no compensation was provided. The insurer claimed that while the victim did die of anthrax, the workers did not contract it while working for the policyholder’s company, but for another company.


California updated its compensation law to removed the “by accident” in the phrase “personal injury sustained... by accident” in 1915. This allowed California’s law to be as “enlightened” as Massachusetts’s law, but as of 1916, no claims for anthrax had been made. Pennsylvania soon followed California’s lead, but as of the publication date (1920), no other states had changed their compensation laws to cover occupational diseases. Despite the lack of modification in compensation laws, some states, like New York, did provide minimal compensation for anthrax if the scratch which allowed anthrax spores to enter the body happened at work. For example, a tanner in New York bumped his jaw on a beam at work while handling skins and caused an abrasion. Since it was “smarting” the worker rubbed his face a number of times with his hand. A pustule formed at the site of the abrasion and a physician diagnosed it as anthrax. The reviewing board deemed the injury as “an accidental injury, [that] arose out of and in the course of his employment.” The insurance company appealed the decision, but court sided with the reviewing board, and a precedent was established in New York state law. Andrews stated that at that time no other states had such cases except New Jersey (where the case’s ruling was the same as that in New York), but he believed that when they did occur the outcome would be similar to the ones in New York and New Jersey.101

The United States in 1920 had accomplished only the first stage of creating legislation mandating reporting laws. Individual states had created legislation that dictated prevention methods, but those laws did not provide protection for all workers coming in contact with raw materials. Individual states had also created compensation laws for victims,

but only Massachusetts, California, and Pennsylvania specifically covered anthrax, though New York had set a precedent for indirect anthrax compensation.

**Industrial Anthrax Treatments**

There were a number of treatments for anthrax in the early twentieth century, both for livestock and humans. These included a vaccine as well as an anti-anthrax serum. Like Pasteur in the 1880s, farmers could vaccinate their animals early in the grazing season as well as those that grazed in infected areas for the most effective results. The vaccines, unfortunately, had to be repeated at least annually to continue the livestock’s resistance whether or not anthrax was a problem that particular year. Improvements were made on Pasteur’s original vaccination by 1902 that combined injecting virulent anthrax bacilli and anti-anthrax serum. By 1916, vaccinations were improved further by combining an anti-anthrax serum and an attenuated spore vaccine. In 1939, M. Sterne devised a livestock vaccine that consisted of “a heavy suspension of avirulent spores in a glycerine-saline solution containing saponin.” Sterne’s vaccine experienced some success and was used in livestock vaccination at least until the 1960s.\(^{102}\) Despite improvements, livestock vaccination proved to be a costly operation, considering the frequency of revaccination as well as the possibility of illness caused by the vaccination itself, and was not always a viable choice for all farmers.

Human treatment options were slightly different than livestock vaccinations because of fears that a vaccine culture might increase in virulence without warning. Thompson offered a popular treatment in his 1914 work on occupational diseases:

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**Treatment.** – A suspected focus of infection should be at once burned out with a cautery, and, if too late for this, the entire infected area must be excised, no matter how extensive it may be. Surrounding infected lymphatics should be excised also.\(^{103}\)

Thompson’s suggestion of removing and the entire infected area was actually a popular treatment for cutaneous anthrax in the late nineteenth and early twentieth centuries. It did not involve any chemical injections and, thus, had no ill side effects to medications. However, Thompson does not comment on the success rate of such procedures.

Another treatment for anthrax was created in 1895 when A. Sclavo devised an anti-anthrax serum that produced amazing results for its time. Sclavo’s original serum was produced by inoculating asses with virulent anthrax. The plasma was then collected from the inoculated ass and injected into humans to ‘cure’ anthrax. Later, scientists used horses instead of asses. The serum was used to treat those who had already contracted anthrax, and not to prevent against the disease. The serum drastically reduced the number of fatalities as Sclavo showed in a study that showed a fatality rate of 6% with serum use as compared to 24% rate under similar circumstances. Sclavo’s anti-anthrax serum was so well received that it remained the recommended standard protocol for anthrax cases for thirty to forty years after its development. Despite these great results, a high number of severe reactions to the serum, or serum sickness, also occurred. These numerous adverse reactions eventually caused the discontinuation of the anti-anthrax serum.

It was not until the 1940s that penicillin was used as an effective anthrax treatment. The American Medical Association approved penicillin as their official treatment of anthrax in 1945. Soon afterwards, other antibiotics, such as chlortetracycline, chloramphenicol, and oxytetracycline, also showed positive results in the treatment of anthrax, though

\(^{103}\) Thompson, *The Occupational Diseases; Their Causation, Symptoms, Treatment and Prevention*, 457.
chlordetracycline did have side effects of nausea and vomiting. The oral dosage of antibiotic pills also proved easier to administer than a series of injections. 104

With the discovery of the cause of anthrax and development of the vaccine and anti-anthrax serum, the ‘conquest’ of anthrax was assured, but the results of the vaccine and anti-anthrax serum was not as miraculous as had been hoped. They were too expensive, had to be given too frequently, did not provide the level of immunity desired, and often resulted in ghastly side effects. The vaccines and anti-anthrax serums were not magic bullets. They cannot be compared to the smallpox vaccine which was more like a magic bullet and eventually ridded the world of smallpox. No anthrax treatment can boost of similar results.

Even with treatment possibilities, basic prevention and awareness methods were still considered equally if not more effective. In his 1963 book, Diseases Transmitted from Animals to Man, Thomas Hull provides a significant amount of detail on vaccinations and anti-anthrax serum treatments, but he also states, “Employees should be instructed to pay attention to every skin wound, even the most trivial, and to apply to the plant dispensary or a near-by physician to have such skins breaks disinfected at once and covered with a protective dressing.”105 Hull also advises on the proper wearing and handling of protective clothing and sterilizing suspicious raw wool or hair. Even with the advances in vaccinations and anti-anthrax serum treatments, these basic prevention methods continued to be more realistic options.

105 Hull, Diseases Transmitted from Animals to Man, 115.
Anthrax and the Consumer

Industrial wool, hair, and hide workers were not always the only ones who were in need of anthrax treatments. There were a number of instances where infected manufactured products reached the general consumer. Consumers using infected shaving brushes or wearing leather gloves were also at risk of anthrax occasionally. One such example was in mid-October of 1915. A prominent lawyer and Justice of the Peace in Riverhead, Long Island, George F. Stackpole, contracted anthrax allegedly from his leather gloves. His case made front page news in the New York Times on October 11 with the extremely dramatic headline: “Anthrax is Killing George F. Stackpole.”106 The paper reported that his anthrax case had been verified via a germ culture, but the source was unknown.

How Mr. Stackpole became infected is uncertain, as he kept no chickens, cattle, or sheep at his place in Riverhead. But physicians say that the germs are easily carried on leather either finished or raw, and it was suggested that it might even in these cases have been transmitted from a considerable distance on a rough glove.

Dr. Cramp told a TIMES reporter last night that he thought Mr. Stackpole might have contracted the disease by scratching himself, and then getting the wound infected.107

The next day, the New York Times detailed that Stackpole had been treated at Bellevue Hospital with anti-anthrax serum, headlining that “Vaccine Serum. Never Used on Man Before.”108 This headline is not entirely true seeing, that Sclavo created and tested the serum in the 1890s. Nevertheless, Stackpole remained optimistic about his condition and the possibility of his recover, though he did say “Now that my end is near, I am ready.” On October 15, Stackpole’s condition became far worse. Stackpole’s face and throat were

extremely swollen, yet he maintained his “happy, fearless spirit” and “frequently smiled as much as physical limitations would permit.”

The New York Times also reported in the article that “two new cases of anthrax in human beings in the vicinity of New York were reported yesterday from Camden, N.J. They are employes [sic] of the Keystone Leather Company…and making favorable progress under a treatment of ‘Lachisis,’ a fluid derived from the venom of rattlesnakes.” No other commentary is provided about the two leather workers or their outcome. The unbalanced amount of attention between an elite consumer and two lower class men show that the public were not really concerned with the diseases of the working class unless those diseases might affect them as elite consumers. In the New York Times, almost every article discusses human anthrax is in regards to upper class individuals who contracted the disease through purchased goods and not workers who developed anthrax as a result of their occupation. Workers’ disease cases were almost viewed as victimless situations.

One of Stackpole’s attending doctors said that serum treatments like the one Stackpole received were common in Great Britain but he was surprised that the serum treatment was not known in New York at that time. Stackpole’s serum treatments did not ultimately help him, and late on October 15, Stackpole passed away from his anthrax infection. The first of two obituaries was printed in the New York Times on October 16, 1915, and the second obituary ran on October 17, 1915.

Six years later in 1921, another case of non-industrial caused anthrax was discovered in a former member of the House of Representatives from the fourteenth Congressional district in New York, Michael F. Farley. Farley complained of a small pimple on his neck

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where he had cut himself shaving about two days before being admitted to Bellevue Hospital. In the article, an associate who drove Farley and some friends to the Danbury Fair two days before entering the Bellevue Hospital recalls recommending that Farley go to the doctor when Farley’s neck began to swell: “When we returned from the fair that night it was just the same, but he next morning it had begun to get bigger, and his neck was swollen. He also said that he was suffering some pain. I begged him to go to the hospital, but he refused.” Farley, like Stackpole, did not survive his disease, passing away only six and a half hours after walking into the hospital. Physicians administered the anti-anthrax serum treatment to Farley, but “he soon lost consciousness and was too weak to respond to the usual anti-anthrax treatment.” The *New York Times* reported Farley’s death on the front page. Farley was thought to have contracted anthrax from an infected shaving brush.¹¹⁰

These men’s deaths were not caused by anthrax they contracted at work. They were killed by simple household objects many New Yorkers owned: leather gloves and shaving brushes. If anthrax was still in products that reached to consumers, then it must have been in the raw materials, the wool, hair, and hides, which workers handled. These two cases are most certainly not the only two in this six-year span. Stackpole and Farley were just a few of the only ones with enough notability to make the pages of the *New York Times*.

**Industrial Anthrax Internationally**

England was still involved in the industrial anthrax discussions in the early twentieth century. Various anthrax committees were still meeting and making suggestions for improved legislation, even though their legislation was far more inclusive than the United States’. One of these committees was the Bradford Anthrax Investigation Board. Ten years

after Bell’s death in 1906, Eurich made recommendations that if all blood stained raw hair and fur products were removed from the other raw materials, anthrax cases would drop significantly.111 Also, in 1919, the British government passed the Anthrax Prevention Act 1919. This act was a step to help “control the importation of goods infected or likely to be infected with Anthrax, and to provide for the disinfection of any such goods.”112 The Act did not specify a particular disinfection method that must be used. Concluding that such suggestions, acts, and laws were effective, the historians Joseph Witkowski and Lawrence Parish have said that anthrax became a medical curiosity in Great Britain soon after 1919.113 Others place the date in the 1930s.

Even though anthrax became a medical curiosity in Great Britain, it was still a serious problem for other nations. In 1921, physicians representing several nations gathered in Geneva under the auspices of the International Labour Office to discuss the problem of anthrax. The meeting concluded that both the farmers’ current method of controlling raw material, which often meant knowingly exporting infected along with non-infected raw materials, and prevention measures during manufacturing, which included wearing protective clothing and maintaining personal hygiene, were not sufficient. The physicians proposed two possible solutions: fight anthrax in living animals and control it before the animals were used for hair, bone, or leather; or kill the anthrax spores before the wool was handled by workers. The general agreement was that the first solution was more logical. They believed that even though anthrax was an industrial problem, it was at its foundation an agricultural problem

112 Anthrax Prevention Act 1919, UK Public General ed. Vol. c. 231919, http://www.statutelaw.gov.uk/content. This website is the “official revised edition of the primary legislation of the United Kingdom made available online.”
since anthrax is contracted from animal sources. Being primarily an agricultural problem, the
majority of the responsibility for solving the problem should be delegated to farmers.

The committee also decided to form a questionnaire for nations and created a
subcommittee to evaluate the issues brought up in the questionnaire further.\textsuperscript{114} This
subcommittee met the following year in London for more than a week, and reviewed the
questionnaire responses from several countries including Japan, Belgium, and the United
States. Subcommittee members also traveled to the government Wool Disinfecting Station in
Liverpool to see it in action. At the end of their meetings, they found that while anthrax was
not as serious of a problem in some countries, such as Japan which noted 10 deaths a year in
the bone industry, it was still a significant problem in others, such as the United States which
reported 126 deaths in Massachusetts alone. The subcommittee also had samples of different
wools and hair from different regions in the world tested for anthrax before and after
disinfection processes. The number of samples was not evenly dispersed among regions, but
they still show some interesting facts. Samples from Persia, East India, and Egypt had by far
the most contaminated samples tested by the committee. The committee was also able to
show that those samples which were infected were completely free of anthrax after
undergoing disinfection processes.\textsuperscript{115} In the end, the International Labor Office’s committee
on anthrax did not provide any groundbreaking work, and only supported conclusions that
had already been introduced in occupational medicine.

\textsuperscript{114} International Labour Office, \textit{Disinfection of Wool Infected with Anthrax Spores: Item III (a) of the Agenda}
\textsuperscript{115} International Labour Organization’s Advisory Committee on Anthrax, \textit{Report of the Committee} (London:
International Labour Office, 1923).
Climax and Decline of Industrial Anthrax in the United States

About twenty years after the International Labour Board Conference, a physician, Dr. Macdonald, working at the Cornwall Hospital in Cornwall, New York studied anthrax as an industrial hazard. In 1942, Macdonald made the claim that anthrax was still a threat to industrial workers. He commented that the inhalation and gastrointestinal forms were far less common than the cutaneous form, but the cutaneous form was a very serious threat to workers, especially wool carpet workers. He claimed that the elevated risk came from the wool imported specifically for carpet making from Asian and other tropical countries. There was no mention of the risk associated with wools from other parts of the world. Macdonald also asserted that if the formaldehyde sterilization methods practiced in England were implemented in the United States, even the most infected wools would be disinfected effectively.116

Details about Dr. Macdonald’s work can be found in the American Wool Handbook.117 The authors of this work, Werner Von Bergen and Herbert R. Mauersberger, also provide some insight into the decisions mill owners faced in regard to worker safety versus cost. Several methods of sterilization were available in 1948. One example was the formaldehyde sterilization method that Macdonald discusses. Another method of disinfection was steam. But unfortunately, the difficulty and cost of proper sterilization methods were usually far too great for the average-sized mill. Also to the misfortune of some wool workers,

116 Werner Von Bergen and Herbert R. Mauersberger, American Wool Handbook: a Practical Text and Reference Book for the Entire Wool Industry, 2d enl. ed. (New York: Textile Book Publishers, 1948) 115. 117 The American Wool Handbook is a volume about wool manufacturing that has been published several times, including in 1938, 1948, and 1963. The book was written by Werner Von Bergen and Herbert R. Mauersberger. Von Bergen was the Director of Research for the Forstmann Woolen Company as well as a former teacher of Wool Manufacturing at Columbia University. Mauersberger was a former Editor of Textile Consultant, the Head of Evening Textile Courses at Columbia University, and the President of Textile Book Publishers, Inc. which published The American Wool Handbook.
many disinfection methods only protected the workers who handled the wool in the later stages of production. In 1948, for the most part, the only protection for the first workers to handle the bale, such as the ones who first opened the bales, were precautions like maintaining a clean working environment in the bale opening rooms and regular bathing by the workers themselves. Large-scale sterilization methods had been invented that would disinfect the raw wool before workers came in contact with it, but these processes were very expensive. Von Bergen and Mauersberger, however, claim that if the precautions to protect workers were regularly followed by workers then the number of anthrax cases would diminish. For any cases that do develop in workers, the workers would be able to detect the early signs of anthrax, such as a small pimple at the site of infection, and could seek treatment from the company physician immediately. The physicians could then treat the infected worker before any threat to a worker’s life occurs.\footnote{Von Bergen and Mauersberger, \textit{American Wool Handbook}, 115.}

The anthrax story as an occupational disease continues even after the late 1940s; in 1957 there was yet another outbreak of anthrax. On August 27, 1957, a factory worker in the combing department of a Manchester, New Hampshire goat hair processing mill contracted the inhalation form of anthrax. Over the course of the next ten weeks, eight more workers also contracted anthrax: four more inhalation cases, and four cases of the cutaneous type. Of the nine victims, four workers passed away from their illnesses; they were four of the five inhalation cases. None of the workers suffering from the cutaneous form died from their illness. The workers were not all from the combing department, however. There were cases in the carding and weaving departments as well. The goat hair reported to be responsible for the infections was imported from Middle Eastern and Far Eastern countries.
This particular incident was termed an epidemic, but anthrax cases were not uncommon at the Manchester mill. One hundred and thirty-six cases of anthrax had been reported from the Manchester mill alone in the sixteen years prior to the 1957 epidemic. The number of cases each year varied from zero to sixteen, for an average of 8.5 cases per year from 1941 to 1957. Before the 1957 epidemic, only one case was fatal; but one hundred and thirty-six cases, with an average of 8.5 cases a year, is quite a substantial number for any one mill. In the numerous charts and tables provided in Philip Brachman’s article, “An Epidemic of Inhalation Anthrax: The First in the Twentieth Century,” a large cluster of anthrax cases is visible in late 1957, with a large percentage of those cases actually occurring within two weeks of another case. Brachman went on to acknowledge that exposure to dust is a common environmental problem reported in early cases of anthrax, particularly inhalation anthrax. He even mentioned Bell’s ideas on improved ventilation and the problem of anthrax in England around 1900.\footnote{Philip S. Brachman, Stanley A. Plotkin, Forrest H. Bumford, and Mary M. Atchison, “An Epidemic of Inhalation Anthrax: The First in the Twentieth Century,” \textit{American Journal of Hygiene} 72 (1960): 7-9 and 19.}

Brachman shed light on the epidemic by evaluating the possible “attack rate” for anthrax epidemics. Out of the six hundred and four employees at the mill, only nine contracted anthrax during the 1957 epidemic. This results in a 1.5\% attack rate. But, Brachman also drew attention to the fact that the employees at the mill are not all at the same risk of contracting anthrax. Workers in the carding and combing departments were at a far greater risk for anthrax than other departments, the weaving department for example. If the attack rate is recalculated, taking into account the workers in higher risk occupations who
had previous developed anthrax,\textsuperscript{120} one finds that the attack rate jumped from 1.5% to 75% for both cutaneous and inhalation anthrax and 50% for inhalation anthrax alone. These numbers are astonishing. But, Brachman provided some possible methods to reduce the number of cases: “to place stress on better ventilation of goat hair mills, or on sterilization of the hair as performed in England.”\textsuperscript{121}

Brachman’s conclusions were nothing new. Scientists and physicians had been suggesting improving ventilation and sterilization methods for years. Simply asking for better ventilation and sterilization methods was clearly not working. Anthrax outbreaks still occurred, and from what the Manchester, New Hampshire mill evidence shows, on a regular basis.

After the 1950s, industrial anthrax cases numbers began to drop in the wool, hair, and hide industries. This was not because of some great legislation that prevented it or because of a novel treatment that completely eradicated anthrax from the industry. Industrial anthrax cases declined because the number of mills and tanneries began to decline. Beginning in the 1960s, the American northeast witnessed the closing and the withdrawing of the industry in the area. There was no expanse in industrial anthrax knowledge.

The human anthrax story as an occupational disease was far from the celebrated victories in the 1880s. The story continued on until almost the 1960s. Yet, people were satisfied with the few results that medicine provided them in the 1880s, and considered anthrax conquered. The specific bacteria cause was known and preventative measures were in place, but there was no cure for anthrax. The triumphal narrative that includes only the

\textsuperscript{120}Brachman believed that contracting anthrax and surviving greatly reduced one’s chances of contracting anthrax a second time.

work of Koch, Pasteur, and Bell perpetuates this notion that anthrax was solved. A closer look at anthrax beyond its bacteriological role shows that despite the appeal of the scientific triumph over anthrax, a longer and wider view suggest that disease and its management are more precisely social and economic problems. In the industrial world, labor conditions and regulation of businesses and processes are more central than the role of medical science.
CHAPTER 3: CONCLUSION

The previous chapter discussed anthrax’s history after the ‘conquest’ of the 1880s. Each outbreak of anthrax after the 1880s brought about a small flurry of public concern and subsequent legislation but nothing greater. After a limited amount of media coverage and a small degree of legislation, each outbreak was eventually forgotten. Nothing definitive remained to mark the troubles of that time and the efforts to prevent future occurrences of anthrax. There was never any awe-inspiring legislation that stopped the anthrax problem completely and conquered it in the way the heroes of the 1880s are said to have done.

Most of the anthrax legislation is actually quite similar. It stresses the importance of personal hygiene with daily showers or baths and wearing gloves or other protective clothing to prevent anthrax spores from contacting the workers’ skin. But that is the extent of legislation. Perhaps the only exception to this pattern is when there were new developments in sterilization processes, such as “duckering,” but even those were few and far between, never making a profound difference. Physicians seemed to be content with the progress they had made in the late nineteenth century. Large outbreaks of anthrax were not common, even if individuals suffered from industrial anthrax regularly, so physicians were satisfied with handling the immediate situation and allowed the larger issue to go untouched. Anthrax was never common enough or devastating enough to bring out the “big guns” to eliminate the problem entirely, like the world witnessed with the smallpox problem.

So anthrax is an interesting choice for the purposes of telling a triumphant story. It does not quite fit as well as other diseases, like smallpox. Smallpox was a frightening disease that was truly widespread. Physicians worked diligently to eradicate smallpox from the world. Legislation was passed; vaccines were handed out freely. A smallpox-free world is a
clear and obvious result of that work. But smallpox is not like other diseases. Epidemiologists can boast of very few other diseases with a history like smallpox. Most other diseases possess a history similar to that of anthrax. Diseases flourish at times, and other times there are very few cases. The greatest reactions to diseases occur during the flourishing times. Other times, some diseases are simply forgotten except by the small group of victims and their families. It is in this way that the story of anthrax is less a story of triumphalism and more a story of an industrial disease that was picked up by the bacteriological field only to be returned to the occupational medicine field virtually unchanged.

Triumphal stories of medicine and science, like the one that is told about human anthrax, might be useful tools for teaching elementary school children about the history of certain diseases. These stories provide the right amount of information for nine year olds. These narratives help them learn the basics to create a strong foundation without getting extremely bogged down in a large amount of detail. But historians and adult students of history, medicine, and science are not elementary school aged children. They are an educated community of scholars capable of comprehending details beyond the basics. Because this educated group of people is capable, it is absurd to continue to perpetuate the myths of their early education.

These narratives have little if anything to offer to the academic realm. These stories focus on the one or two heroes in each account. For anthrax, the focus was on Robert Koch, Louis Pasteur, and, in some stories, John Henry Bell. These men’s work was truly outstanding, and they helped accomplish great things in the study of anthrax both in scientific and medical settings. But they were not alone. There were many others who played important roles, such as Nicolas Fournier, Davaine, and John B. Andrews. These men also helped to
expand the knowledge of Koch, Pasteur, and Bell. Fournier and Davaine helped create a strong research foundation that laid the groundwork for Koch and Pasteur. Andrews helped continue Bell’s work of connecting anthrax with the textile industry long after Bell’s death. These men and others fill in the gaps in the history of anthrax. They provide the history before the ‘heroes’ and the legacy afterwards.

Triumphant stories also have little to offer the public sector. All that these narratives accomplish is to limit the general knowledge about certain diseases like anthrax. It prevents people from knowing that anthrax is not only a modern day biological terrorist weapon. Modern historians researching anthrax are most likely approaching the topic with bioterrorism in mind. As David Morens notes,

In late 2001, anthrax bioterrorist attacks in the United States prompted considerable commentary on how little is generally appreciated about the transmissibility of Bacillus anthracis. Textbooks have long described anthrax as a veterinary disease of minor medical importance, attributing most human infections to occupational exposures, now less common in industrialized nations.122

After the anthrax cases in Washington, DC, in 2001, the public was made aware and alarmed at the possibility of a widespread anthrax attack in the United States. And yet this vision of anthrax is a new development, with little connection to livestock and cutaneous anthrax. Moreover, the modern public reaction to “anthrax” is entirely different from past episodes. If the modern scholar looks back and expects to see a large public outcry about people being diagnosed with anthrax in the 1800s and early 1900s, she cannot help but notice the lack of alarm. People around the turn of the twentieth century knew about anthrax but did not give it extraordinary attention. Perhaps these preconceived notions about fears of anthrax are a

result of living in a time where anthrax is no longer seen predominantly as an occupational
disease but as a bioterrorism weapon. Anthrax frightened textile workers who had the
potential of coming into contact with spores on a daily basis at work, but that fear pales in
comparison to the fear that anthrax created in the past few decades. The image of anthrax has
altered significantly over the several decades from occupational hazard to bioterrorist threat,
and widespread general public fear is a relatively novel phenomena.

Unfortunately, scholars are also still making use of the triumphal tone in their writing.
Although scholars try to steer their writing away from the Whiggish nature of triumphalism,
they can still fall victim to it. They make use of the hero’s work to support their arguments
and disregard the work of those who led up to and came after the hero. A recent example of
this is N. Metcalfe’s article “The History of Woolsorters’ Disease: A Yorkshire Beginning
with an International Future?”123 In his article, Metcalfe tries to argue that because of the
modern day threat of anthrax as a bioterrorism weapon, people should understand the
historical lessons of anthrax’s past. His puts forth that his article will convey the history of
anthrax as an occupational disease and the responses that it elicited from workers and
physicians. Metcalfe then proceeds to give a detailed account of the John Henry Bell story as
well as Eurich’s work after Bell’s death. After about two pages of the standard triumphal
narrative, Metcalfe devotes two paragraphs to the decline of anthrax and its history of a
bioterrorist threat. His article glances over the problem of industrial anthrax between the
years of 1920 and 1960. Metcalfe perpetuates the triumphal narrative tone that industrial
anthrax was only a problem for the nineteenth and early twentieth centuries, which Koch,

123 N. Metcalfe, “The History of Woolsorters’ Disease: A Yorkshire Beginning with an International Future?”
Pasteur, and Bell solved in the 1880s, and anthrax as a bioterrorist threat is a problem of the past few years.

Another false perception of triumphal stories is the notion that researching diseases and their treatments as a linear process. Certainly even Koch and Pasteur would be the first to agree that research is never an easy black and white process with clearly defined steps. It is true that scientists have goals in mind about what they would like to discover, but experiments often go awry. Experiments do not work correctly. They must be repeated to assure clear and reproducible results. They produce unexpected results that return the researcher back to the beginning of their thought processes. There are holes, jumps, and dead ends in scientific research. The triumphal story masks this reality of the scientific research process from its reader creating the illusion that science is a linear process. Propagating this image of science only continues to uphold half-truths and incorrect information in formal science education.

The triumphal story of anthrax is not complete. It omits a number of noteworthy scientists and physicians who played an important role in what anthrax is, how it can be contracted, and how it can be treated. The narrative focuses on the legacy of Koch, Pasteur, and Bell’s work, excluding the people who continued to work to end anthrax infections. A conclusion that the three “heroes” did not reach. It excludes the outbreaks of anthrax in textile mills in the twentieth century. It excludes the laws that were created to control the importation of infected or suspicious raw products and the legislation to require reporting of anthrax cases. The triumphal narrative disregards anthrax as what it was before the 1880s and into the twentieth century: a story about an occupational disease.
EPILOGUE

In 2007, anthrax is a disease that frightens the general public. Even laypeople are aware of what anthrax is, how to get it, and what the possible outcomes of the disease are. But this public knowledge is not the result of any industrial legislation or a recent epidemic of woolsorters’ disease. Widespread public knowledge in current times draws on the events of 2001, when several letters containing anthrax were sent to a number a news media stations and to two Congressmen. Anthrax was being used as a bioterrorist weapon. Anthrax was no longer merely a random disease of yesteryear that affected a small group of hair and fur workers. It was a disease that could potentially harm anyone in any part of the country regardless of occupation.

In September and October of 2001, a number of anthrax infected letters were sent to prominent media and government figures in New York, Washington, D.C., and Florida. Over the course of the next two months, appropriately twenty people were diagnosed with anthrax including postal workers, Tom Brokaw’s assistant, a U.S. State Department mail processor, and Senate staffers. Some suffered from inhalation anthrax while others had the cutaneous form. In the end, five people died from the inhalation form of anthrax. In September of 2006, scientists reported that the anthrax contained in the letters was not weapon-grade anthrax, and probably the work of an individual and not a terrorist organization. Regardless of its source, the anthrax attacks significantly impacted the American population. Panic was clearly seen in the citizens who tried to hoard the antibiotics known to treat anthrax, such as penicillin, Cipro, and doxycycline. According to the New
*York Times*, the federal government had a ready supply large enough to treat 2 million people for 60 days that could be shipped to an attack location within twelve hours.124

In September of 2001, I was a freshman at East Tennessee State University getting ready to turn nineteen and barely one month into my collegiate experience. The anthrax attacks, as well as the attacks on September 11, affected me very deeply. I had been removed from my small hometown and relocated to the largest city I had ever lived in: Johnson City, Tennessee. Though Johnson City had only just over 55,000 residents, it had more than four times the population of McMinnville, Tennessee, where I had lived since I was born. The simple move from McMinnville to Johnson City took me out of my small town environment into what I considered at the time to be the “big city.” I had to worry about making sure my car and dorm were locked all the times (including when I was inside them), or getting run off the interstate or other enormous roads that ran through town.

All of these changes happened when the anthrax attacks occurred. Not only did I no longer feel safe because I had moved to a larger town, but I felt a vulnerability in everyday living that I had never experienced before. The attacks brought about a realization of how susceptible I and all other Americans really were. I had once thought that war was a thing that happened elsewhere in other countries, but never in the United States. My illusion was shattered and I was quite apprehensive. Before 2001, I cannot remember having any knowledge of what anthrax was. If I did, I imagine I held anthrax in the same esteem as tetanus or malaria: a disease in my biology textbook that I found interesting because of some striking pictures, but not one that I really gave much thought to or knew in any detail. The

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anthrax attacks created a new connotation of the disease for me and it truly distressed me. I looked at my mail differently even if it came from someone I knew.

Eventually, as the publicity of the attacks slowed and faded away, my fears eased and I stopped looking at mail from unknown sources so suspiciously. As the years passed, anthrax was not mentioned very often in the news or my classes; but when it was, the feelings and anxiety I experienced as a college freshmen returned, not as strongly but still quite present. As I began working on my master’s thesis and discussing possible topics with Dr. Kimler, I began looking into various diseases. The flu in World War I greatly intrigued me, but Dr. Kimler warned that finding a new angle in that topic may be difficult and gave some alternative ideas. One of his alternatives was the idea of anthrax as a cattle disease. My only real experience with anthrax was what the media told me in 2001, and my knowledge of anthrax was just a handful of pictures. Neither of these sources had informed me that anthrax was a cattle disease. Despite my feeling associated with the attacks in 2001, I thought that anthrax as a cattle disease would be an engaging topic to research.

As I did more and more research, I found that anthrax affected several species of livestock and not only cattle. I also learned about the cross-over between woolworkers and wool infected with anthrax. As I began my research by looking through medical and scientific journals and newspapers of the late nineteenth century for discussions about the woolworkers’ plight, I was honestly surprised by what I saw, or rather what I did not see. I expected the journals of the time to be overflowing with articles about anthrax and precautionary advice. But I did not. Anthrax was only one of many other topics that filled a few pages of the medical and scientific journals every couple of issues. The medical and scientific world was not in complete upheaval about these workers and anthrax. I was beyond
shocked. Where was the frenzy? Why were they not filling the pages of all pertinent works with research on how to prevent anthrax?

These were some of the questions that fueled my research. But my questions spawned a new and larger one about my own perceptions. Why was I expecting to see something so different than what I found? In the 1800s and 1900s, people knew anthrax as first and foremost an industrial disease. If they did not work in the hair and fur trades, they did not have much to worry about. My first major encounter with anthrax came in 2001, only one week after the events of September 11. I had come to terms with the reality of anthrax in a much different manner than did people in the 1800s and 1900s. In 2001, Americans became infected and died because of an outside risk at their workplaces, not the inherent danger which woolsorters faced. The United States government went to great lengths to figure out who had sent the anthrax ridden letters. The American public also demanded answers and the wrongdoers punished. With the stir the situation caused in 2001, I expected to see something similar, the same kind of intense reaction in the 1800s. These expectations were based on the anthrax events of 2001. While the people of the 1800s encountered anthrax as merely an industrial disease, I encountered anthrax as a personal affront to my general safety and well-being.
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