

The Indianapolis Literary Club 2013-2014: 138th Year

“A Fever When Walter Came To Indianapolis”

Essayist: Stephen J. Jay M.D. Read on Monday, 8:00 P.M., 3 February 2014, at the regular meeting of the Indianapolis Literary Club, Park Tudor School

“When Nature has work to be done she creates a genius to do it.”

---Emerson

“In all things sought to see the Whole, Brooked no disguise;
And set his heart upon the goal, Not on the prize.”

--William Watson, In Laleham Churchyard, Aug 18, 1890, stanza 11.

“But dream not helm nor harness-The sign of Valor true; Peace hath higher test of
manhood-Than battle ever knew.”

---John Greenleaf Whittier. The Hero, April 1853, Stanza 19

“Thine the victory, As the just Future measures gain.”

---James Russell Lowell.

“Knowing is not enough; we must apply

Willing is not enough; we must do.”

---Johann Wolfgang von Goethe (1749-1832). Wilhelm Meisters, 1830

“Walter Reed, graduate of the University of Virginia, the army surgeon who planned and directed in Cuba the experiments which have given man control over that fearful scourge, yellow fever.”

--President Eliot, Harvard University, on bestowing the honorary degree of M.A., 1902.

Stephen J. Jay M.D. "A Fever when Walter Came to Indianapolis" ILC 3 Feb 2014

Introduction:

At the U.S. Army Camp Lazear, in Cuba, December 5, 1900, at 2 pm, Private John R. Kissinger, 23, a non-immune occupant of Tent No. 2, volunteered to be bitten by mosquitoes that had bitten fatal cases of yellow fever. Three days later he was dizzy with headache and awoke with aching chills, complaining: "My spine felt twisted...and my eyes felt as if they would pop out of my head..." Exam showed red eyes and jaundice. For three days and nights his temperature exceeded 102, but it broke December 13, and he gradually recovered. Experts in Havana said it was Yellow fever.

Pvt. Kissinger, a Hoosier raised in Liberty Mills, Wabash County, suffered a dreaded disease whose history was shrouded in obscurity with more than 150 names given the ailment over 300 years: *Malignant Fever; Coup de Barre, Barbados Distemper, and American Plague*. First called "Yellow Fever" in 1750, its nickname, "Yellow Jack," came from the yellow quarantine flags infected ships flew.

The cause of yellow fever was unknown until U.S. Army Major Dr. Walter Reed presented a paper titled: "*The etiology of yellow fever: a preliminary note*" in Indianapolis, October 24, 1900, in the German House (Athenaeum) amphitheater at the Annual Meeting of the American Public Health Association. Reed's conclusions were startling to attendees: First, the bacterium thought by scientists to cause yellow fever, did not cause the disease, and second, the mosquito served as the intermediate host for the parasite of yellow fever. The Indianapolis Journal called Reed's presentation: "fascinating."

Aims of this Essay:

My aims this evening are to explore how the Spanish American War, created necessity for medical innovation; to suggest that the discoveries in Cuba were made possible by a rare confluence of inspired leadership and dedication to the greater good; and to propose that discoveries of the Yellow Fever Commission were a catalyst for medical science, for shaping attitudes toward heroic action of citizens, and for raising awareness of moral and ethical questions about human experimentation, issues relevant today.

History of Yellow Fever

The yellow fever virus arose in Africa 2,500 years ago and emerged in the Americas with the slave trade. Scholars believe the first credible evidence of yellow fever was the epidemic in Barbados in 1647. By 1750, the disease was prevalent in the West Indies, South America, and

coastal North America and prompted government action to prevent outbreaks. Massachusetts passed the first sanitary law in America, in 1647, a maritime quarantine. American presidents grappled with the contentious question: “Are local, state or federal jurisdictions accountable for preventing and managing epidemics?”

Philadelphia

In Philadelphia, the epidemic of 1793 shifted America’s *laissez faire* response to threats to health and commerce. The largest outbreak recorded in the U.S., it swept the city from August 25th through October, killing one in ten citizens. Carts, wagons, and coaches carried terrified families to the country, as vividly described in previous plagues by Boccaccio in the *Decameron* and Defoe in *A Journal of the Plague Year* in 18th c. London. In Philadelphia, Thomas Jefferson wrote to James Madison that everyone who could escape Philadelphia was doing so.

Seventeen thousand of 45,000 citizens fled, and Philadelphia was effectively quarantined by neighboring cities, paralyzing America’s center of culture, finances and politics. President Washington and his cabinet met in a small town 10 miles from Philadelphia, but Washington left the city September 10, because in his words: “Mrs. Washington was unwilling to leave me surrounded by the malignant fever which prevailed..” .

The College of Philadelphia Medical School, including Benjamin Rush, struggled to cope. Mayor Clarkson ordered streets cleaned and filth hauled away; he stopped continuous tolling of bells and building fires in streets. A fever hospital at Bush Hill sheltered the poor, and Rush recommended treatment of bark, wine, laudanum and cold baths; when these failed, he urged bleeding and purges of calomel and jalap. Citizens carried sponges soaked in vinegar, wore camphor bags around their necks, and some carried their own lancets over fear of being bled by the lancets of bleeders.

Political clashes flared over the origins of the epidemic. Rush, Noah Webster and Republicans championed the local theory, believing that miasmata from nearby swamps and effluvia from rotting coffee beans on unsanitary docks bred fever. Federalists said it was an imported disease and wanted quarantines to exclude the French immigrants. Republicans saw importationism as a plan to wreck their lucrative trade with the West Indies. In compromise, Philadelphia adopted sanitary reform supported by Republicans and quarantine advocated by the Federalists. A November frost ended the epidemic of 1793.

To counter threats to commerce in port cities, President Adams signed an Act in 1798 that provided revenue for sick or disabled seamen in hospitals, the early U.S. Public Health Service. While foreign commerce suffered, occasionally America benefitted from tragedy, as when Napoleon abandoned North America after losing 23,000 troops to yellow fever in Haiti and sold his Louisiana holdings in 1803 to Thomas Jefferson.

Memphis

When the Atlantic slave trade was abolished in 1807, yellow fever retreated from the north, but flourished in the south. The tragedy of Philadelphia was repeated in Memphis in 1878. The toll of Memphis citizens would surpass that of the Chicago fire, the Johnstown flood and the San Francisco Earthquake combined. A turning point in American History, this was the largest yellow fever outbreak in America; it showed the vulnerability of the Mississippi Valley to disease imported from the West Indies.

Memphis was hot and wet in 1877, sparks that could silently ignite a fever epidemic. Meteorologists tell us the mysterious weather was caused by one of the strongest El Nino episodes on record. Mosquitoes (*Culex fasciata*, known today as *Aedes aegypti*) flourished in rain barrels and cisterns. River boats brought infected people up the Mississippi. By late July, fever was silently creeping into Memphis; on August 14, the first case was reported and chaos ensued and raged for two months; 10,000 persons, 20% of the citizens of Memphis died of yellow fever. Financial systems collapsed; the cost in the Mississippi Valley: more than \$350 million in today's currency. As in Philadelphia one hundred years earlier, a frost ended the epidemic October 24th, 1878. A few clinicians and scientists had suspected the connection between mosquitoes and yellow fever, but this would not be proven for another two decades.

A remarkable account of the tragedy of Memphis was chronicled in 1879 - 454 pages-by John Keating. Indiana contributed \$13,787.69 for relief-eighth highest among forty-six states. Five Indiana physicians who volunteered there developed yellow fever and two died. Dr. John Renner of Indianapolis arrived in Memphis August 29, 1878, and died of yellow fever two weeks later at 28. His monument at Crown Hill Cemetery, reads: *"Died ...Of yellow fever. A victim in the cause of humanity. Erected by his fellow members of the Second Presbyterian Church, Indianapolis, as a tribute to his Christian heroism."*

The Memphis outbreak spurred national debate on how to control epidemics to protect health and commerce. The source of the Memphis epidemic was suspected to be Cuba and their non-immune European immigrant laborers, refugees, and contraband slave trade which connected Cuba, Africa, the West Indies and America. A system of national quarantine was proposed in the U.S. to protect southern ports.

Spanish American War

The U.S. Army was worried about sending troops to an unstable and fever infested Cuba. France had lost 22,000 workers to disease in the failed effort to build a Panama Canal. The Spanish-American War from April 25-Aug 12, 1898, brought thousands of American and Spanish soldiers to Cuba; of 3,000 American deaths, 80% died from yellow fever and other infectious diseases. The Spanish Army suffered 60,000 deaths; 50,000 from disease. *The Treaty of Paris*

ensured that victorious Americans would occupy Cuba and remain at high risk for fatal diseases. U.S. Army Surgeon General Sternberg knew that fever must be eliminated to protect troops and prepare for expanded U.S. commerce in the Americas.

The Yellow Fever Commission in Havana

The stage was set for a strike against yellow fever. Sternberg was well-suited for the task, as a physician, a veteran of three wars, preeminent scientist, bacteriologist and yellow fever expert.

He was called the *Father of American Bacteriology* by the German discoverer of tuberculosis, Robert Koch. For years, Sternberg had collaborated with a prominent yellow fever researcher, Dr. Juan Carlos Finlay of Havana, whose iconoclastic proposals in 1881, that mosquitoes (*Culex fasciata*) transmitted yellow fever and mosquito control could prevent yellow fever, were about to gain credibility. Sternberg established a Yellow Fever Commission and handpicked men whose work would change the history of science and public health and offer opportunities for righting America's ships of commerce and influence in the Americas.

On May 23, 1900, Sternberg requested the Adjutant-General of the Army to authorize sending the newly formed Commission to Camp Columbia, "(to) ...pursue scientific investigations with reference to the infectious diseases...prevalent in Cuba." Sternberg chose Walter Reed, Army Medical Corps and professor of bacteriology at the Army Medical School, to Chair the Commission; other Medical Corps members included Dr. James Carroll, bacteriologist; Dr. Aristides Agramonte, pathologist, and Dr. Jesse Lazear, a mosquito expert.

Walter Reed (1851-1902)

Reed was born in Gloucester Co. VA in 1851, his father a distinguished Methodist minister and mother a daughter of a prominent North Carolina planter. With "intellectual brilliancy", Reed became the youngest graduate of the University of Virginia medical school, at 17. At 22, he became a sanitary officer in Brooklyn and New York City, until he decided to join the U.S. Army as a frontier physician, in 1875. He married Emilie Lawrence in the Arizona Territory, and they had two children and adopted a Native American child, who had been badly burned and left to die.

After fifteen years on the frontier, Reed and his family returned east where he studied under Welch at Johns Hopkins. Welch, who influenced some of America's greatest medical minds including Osler, Halstead, and Flexner, had himself been handpicked by John Shaw Billings, the founder of the National Library of Medicine and a famous Hoosier. Reed was surrounded by preeminent researchers and he elected to focus on infectious diseases and sanitation research.

Sternberg's choice of Reed was a wise one. Reed was a highly respected and seasoned physician and an excellent military epidemiologist. He had done research in typhoid fever, documenting that flies and personal contact spread the disease. Modest, prepossessing, and diplomatic, Reed had leadership attributes that Dr. Sternberg needed.

Sternberg appointed administrators to support Reed's Commission. Leonard Wood, Medal of Honor winner and a personal physician to Presidents' Cleveland and McKinley, had led the Cavalry Division of V Corps, including the "Rough Riders", to victory at Kettle Hill and San Juan Heights. At the end of the war, he became Military Governor of Cuba; control of infectious diseases was Wood's priority.

Another Sternberg appointment was Dr. Jefferson Randolph Kean, a personal friend of Reed's and a man described by Nobel Prize Winner, Philip S. Hench, as possessing "one of the keenest, most scholarly minds...." A great-grandson of Thomas Jefferson, Kean, was expert in tropical diseases and sanitation; he served as chief surgeon for the Department of Western Cuba, while a colleague, William Gorgas was Sanitary Officer of Havana.

Sternberg's team was now assembled, and work began on one of the great challenges in the history science and public health.

Reed's Experiments:

Early Studies

Walter Reed sought answers. What was the cause and mode of transmission of yellow fever? These were not new questions. Stubbins Ffirth, a trainee at the University of Pennsylvania, proposed, in 1804, that yellow fever was not contagious since it disappeared in winter. He exposed animals to bodily secretions of yellow fever patients, without effect. He inoculated himself in an attempt to reproduce the disease by ingesting fresh black vomitus and inserting drops of it in his eye and in self-inflicted skin lacerations. Next, he inhaled gas from burning vomitus and repeated these studies, again without effect. Ffirth concluded the disease was neither infectious nor contagious. One hundred years later, Dr. Carroll, on Reed's Commission, acknowledged that Stubbins Ffirth came very near to proving that yellow fever could be inoculated in humans, long before the Yellow Fever Commission proved the point.

Other researchers said mosquitoes might transmit yellow fever: Dr. Nott of Mobile, in 1848; the French scientist, Beauperthuy, in 1853, and Dr. Finlay in Havana, 1881. Finlay attributed his idea to Benjamin Rush who, when reflecting on the 1793 yellow fever epidemic in Philadelphia, made a singular observation that, "insects have lately appeared and multiplied in an unusual manner..."

Commission Begins Work

Aware of this early research, Reed's Commission began its work June 25th, 1900. They quickly proved that the bacterium proposed by Italian bacteriologist, Dr. Sanarelli, did not cause yellow fever.

The Commission turned to the question of how yellow fever was propagated from sick to well persons. Reed and Lazear had recently learned from Dr Henry Carter of the U.S. Marine Hospital Service that, while the incubation time for yellow fever was five days, there was a delay in secondary infections of ten to twenty days. Reed thought Dr. Finlay's theory could explain this curious delay, if the infection was conveyed in an intermediate host, such as the mosquito, to a non-immune person. This idea became central to solving the riddle of transmission of yellow fever, and Reed told Carter after the Commission's research was completed, that "... (his) your ... work in Mississippi did more to impress me with the importance of an intermediate host than everything else put together." But, in addition to Carter's observations, Reed was familiar with a recent report of British physician, Dr. Ronald Ross, who had proven that malarial fever was transmitted by the *Anopheles* mosquito. These research findings led Reed to search for an intermediate host. The question was how to proceed.

Since animal models of yellow fever were unknown, human experiments were deemed necessary. Reed's Commission and Sternberg's military command believed such experiments were critical to saving lives of the troops. Commission members agreed to subject themselves to experiments, before asking volunteers, and they insisted that volunteers complete written informed consent before research began; a stipend of \$100 was offered for their participation, and they would receive another \$100 if they developed yellow fever.

Preliminary Experiments and announcement in Indianapolis

As the research was being organized, Reed was called to Washington, D.C., to complete his typhoid fever report. In his absence, Drs. Lazear and Carroll, in uncontrolled studies, volunteered to be bitten by infected mosquitoes - without result. On August 27th, however, Carroll was again inoculated and developed severe yellow fever, but recovered. Then tragedy struck. Dr. Lazear was bitten while on the yellow fever ward and died at 34 of acute yellow fever, in the words of one biographer as, "a martyr to science and a true hero."

Two of 11 cases in these studies developed yellow fever; the negative cases were likely bitten by mosquitoes that had not had time to incubate the organism. Based on these cases and the presumed "accidental" case of Dr. Lazear, Walter Reed stated in his "Preliminary Note" in Indianapolis that "The mosquito acts as the intermediate host for the parasite of yellow fever." He based his conclusion on theory, two unconfirmed but suggestive cases, and one convincing case.

Based on these data, Chief Surgeon of Western Cuba and Reed's close friend, Dr. Kean, issued an historic General Order No. 8, under direction of Major-General Wood, directing that Army units in Cuba prevent the breeding of mosquitoes and protect against their bites. General Order 8 ordered: mosquito bars (screens) in all barracks and hospitals; destruction of larvae or young mosquitoes ("wiggletails") by use of petroleum on the water where they breed; and elimination or treatment of all standing water with kerosene. Systematic "mosquito warfare" had begun for the first time in the world in the U.S. Army, in Cuba on October 13, 1900; just days later Reed announced his findings in Indianapolis.

Definitive Experiments in Stage Two

Reed knew the scientific community would require more rigorous proof of his conclusions, and he sought to determine whether infection in non-immune persons was caused by the bite of a mosquito, by contact with fomites, such as clothing or bedding, or by injection of blood from those suffering from the disease. He conducted stage two of this historic research at Camp Lazear, named in honor of their recently deceased Commission member.

In November 1900, non-immune volunteers were exposed to intimate contact with fomites; injected blood from patients with yellow fever; and to bites of infected mosquitoes. Two small wooden buildings were constructed for these studies. Seven volunteers occupied Building 1, and for 63 days slept on infected bedding, wore garments of yellow fever patients and three times per day opened, unpacked and repacked boxes containing grossly contaminated bedding. Four volunteers were injected with 0.5 ml. to 1.0 ml of blood from patients with yellow fever. Other volunteers were allowed to be bitten by mosquitoes that had fed on yellow fever patients.

The first volunteer for this experiment was Pvt. Kissinger, whom we met at the outset of this essay. Camp Lazear had been opened only two weeks, when Kissinger volunteered; he told Reed he was volunteering "in the interest of humanity and ... science." He refused the \$100 payment promised volunteers. Reed said: "... this exhibition of moral courage has never been surpassed in the annals of the Army of the United States." Kissinger became a hero around Camp.

When Kissinger showed early signs of yellow fever: Reed wrote his wife Emilie: "We have succeeded in producing a case of unmistakable yellow fever by the bite of the mosquito." "... Rejoice with me, sweetheart, as, aside from the antitoxin of diphtheria and Koch's discovery of (tuberculosis), it will be regarded as the most important piece of work, scientifically, during the 19th c." Two days later, he wrote Emilie optimistic over Kissinger's likely recovery, and said: "Six months ago, when we landed on this island, ...nothing was known concerning the propagation and spread of yellow fever...but today the curtain has been drawn—its mode of propagation is

established..” Thus, days after Reed first presented his evidence in Indianapolis, Hoosier Kissinger’s case provided Reed a high level of certainty that his conclusions were correct.

Based upon the results of these controlled trials, Reed famously concluded the following: that fomites do not carry the agent of yellow fever; that patients with yellow fever have in their blood the agent that, if injected into a non-immune person may transmit the disease; that the mosquito acquires the agent from an infected person through their bite; that only through the bite of a female *Culex fasciatus* mosquito could the disease be transmitted, and that an attack of yellow fever confers immunity against subsequent infection. Dr. Finlay of Havana, whose theory formed the basis of this research, was congratulated and delighted, at age 67, to know his labors since 1881 had borne fruit.

Walter Reed presented his results in Havana at the Pan-American Congress, February 4-6, 1901; the paper, including its eleven conclusions which remain unmodified today, was immediately published in the Journal of the American Medical Association; news spread quickly around the world.

With his work completed, Reed left Cuba and never returned. Reflecting on the Commission’s research, he credited their success to the volunteers; the dedicated physicians and staff who did this dangerous work; and the leadership of Major-General Leonard Wood and Jefferson Kean. Reed said none of the remarkable research could have been accomplished without their leadership.

Clara Maass

Following Reed’s elegant experiments, Major General Wood approved further research by Dr. Guiteras, a Cuban physician, Major William Gorgas, chief sanitary officer of Havana, and Commission member Dr. Carroll; they sought to produce mild cases of yellow fever to create immunity. At the Las Animas Hospital in Havana, they produced ten cases; but, tragically, three persons died, including the only female volunteer, a 25 year old American nurse, Clara Maass, from New Jersey.

Miss Maass had volunteered to serve in the Spanish - American War and spent time in Cuba and the Philippines. At the request of Major Gorgas, Miss Maass returned to the Hospital as a research volunteer. She was bitten numerous times over four months, without results, but on August 14th, 1901, she developed yellow fever and died ten days later. The three deaths signaled the beginning of the end of human experimentation with yellow fever in Cuba. But, during the interim, important research was completed by Dr. Carroll, who proved that filtered serum from a patient with disease could transmit yellow fever to another person. He discovered for the first time in humans that a filterable, non-bacterial agent, a virus, could be

transmitted from one person to another. Shortly afterwards, the War Department ordered that all human experimentation in yellow fever cease.

Reed's yellow fever research had begun in June 1900; it ended September, 1901. Remarkably, of the 22 cases produced by the Yellow Fever Commission, no volunteers died. Dr. Lazear was an "unofficial" volunteer and not counted in these statistics. Historians have speculated that had Reed's research caused three deaths, as experienced by Dr. Guiteras, the Yellow Fever research in humans would likely have been abandoned, thus delaying effective public health measures to prevent the disease.

William C. Gorgas and Sanitation Control in Cuba

Once Reed's research was published, the pressing question was: Can the findings be used in sanitary engineering and mosquito control to prevent yellow fever? At the direction of Leonard Wood, this question was immediately put to the test in Havana.

The task fell to Surgeon-Major William C. Gorgas, the son of Josiah Gorgas, brigadier general in the army of the Confederacy. While Dr. Gorgas was skeptical that mosquitoes conveyed yellow fever, he showed in dramatic fashion that control measures, based on Kean's General Order 8 a few months earlier, eliminated the disease. Within ninety days of implementing the regulations, on February 15, 1901, Havana was freed from yellow fever for the first time in history.

In striking contrast to these results was the failure to achieve similar effects in an epidemic at Laredo, Texas. This disappointing result was attributed to lack of authority of public health officers in Laredo to carry out sanitary measures. Researchers concluded that without undisputed authority of Government, the results achieved in Havana, under martial law, would not be possible, an observation relevant in 2014 for preventing or managing epidemics.

Gorgas in Panama

The successes of Havana made possible the construction of the Panama Canal, and with support of the International Health Board of the Rockefeller Foundation, the swift control of yellow fever.

In April 1904, Gorgas was appointed chief sanitary officer of the Panama Canal Zone and adviser to the Canal Commission. It took him two and one half years to make the Panama area fit for large scale human habitation, and \$10,000,000 was spent on sanitary control during the ten year project. Of note, racial discrimination in public health practices in Panama resulted in marked differences in death rates from malaria and yellow fever among workers. Gorgas became world famous for his work in yellow fever eradication and in 1914 was appointed Surgeon General of the U.S. Army.

We know today that yellow fever is caused by a flavivirus similar to Dengue Fever and West Nile disease. In 2014, it is endemic in tropical Africa and Latin-America where populations of 900 million people are at risk. Worldwide, there are 200,000 cases annually with 30,000 deaths. A vaccine exists that prevents the disease, but many lack access to it. In West Africa, yellow fever is re-emerging because of wars, poverty, and lack of vaccination. In the U.S., since 1970, only nine cases of yellow fever have been reported in unvaccinated persons; all were recent travelers to Africa or South America; eight died.

Reed's Untimely Death

When Walter Reed returned from Cuba in February 1901, he rejoined the faculty of the Army Medical School. World famous, he received many honors, including honorary degrees from University of Michigan and Harvard. Dean Welch of Johns Hopkins said the Yellow Fever Commission's discoveries were second in importance only to discovery of anesthesia in American contributions to medicine.

After months of separation from his family, Reed enjoyed time with wife, Emilie, and daughter, Blossom, at Keewaydin, their mountaintop retreat home in the Catocin (Ca-Toc'Tin) Mountains near Blue Ridge Summit, Pennsylvania. Perhaps his most meaningful recognition came from his family at a Christmas celebration, where Reed was presented with a small object with wiry appendages—a mock mosquito—to which was attached the following verse:

Over the plains of Cuba

Roams the mosquito wild

No one can catch or tame her

For she is Nature's child.

With Yellow Jack she fills herself

And none her pleasure Mar,

Till Major Reed does Capture her,

And puts her in a jar..."

In the fall of 1902, Reed experienced abdominal pain; on November 17, surgeons found a ruptured appendix and peritonitis; Reed died six days later, November 23, 1902. At funeral services, preeminent figures in American medicine were present: Welch, Osler, and Flexner. The inscription on Reed's grave marker was selected by his close friend, Jefferson Kean, from

the honorary degree Reed had received from Harvard: “He gave to man control of that dreadful scourge yellow fever.”

Walter Reed would have been a likely candidate for the Nobel Prize. Ironically, Ronald Ross won the Prize December 10, 1902, for discovering the mosquito transmission of malaria. This was just days after Reed’s death. Ross also won the Nobel Prize in 1907, for discovering the parasite of malaria in human blood.

Aims revisited:

The remarkable story of the discovery of the intermediate mosquito host of yellow fever suggests some truth to the adage attributed to Hippocrates, that ‘war is the only proper school for a surgeon.’ Advances in battlefield surgery by Paré in the 16th c. and development of the ‘flying ambulance’ by Napoleon’s Surgeon in Chief Dominique-Jean Larrey in the early 19th c. were innovations born of necessities of war. Major medical innovations have come from all U.S. wars in the 20th and 21st c. The imminent threats to our troops from epidemic diseases in the Spanish-American War provided the necessary focus and energy needed for historic discoveries in Cuba. There Plato’s proverb: “Mater atrium necessitas,” is fitting: Necessity (was) the mother of invention.

The success of this effort is attributed to leadership and organizational skills of Surgeon General Sternberg and his hand-picked researcher, Walter Reed; they assembled the team, carried out this pioneering research, and accomplished the task in less than a year.

Their human experiments had major repercussions that resonate today. The use of signed informed consent in 1900 was unprecedented, and the routine use of informed consent in medical research in America did not occur until the 1960s. Neither the 1946 Nuremberg Code nor the 1948 Universal Declaration of Human Rights was sufficient to promote universal informed consent. But, the tragedies and ethical issues the Reed Commission grappled with in 1900 are still being debated in 2014.

Afterword

One of Reed’s great disappointments was the death of his friend and colleague, Jesse Lazear, who left his wife, one year old son and infant girl. Reed said of Lazear’s life: “filled with an earnest enthusiasm for the advancement of his profession and for the cause of science, he let no opportunity pass unimproved.” At Johns Hopkins, a memorial to Lazear bears the inscription: “With more than the courage of the soldier, he risked and lost his life to show how a fearful pestilence is communicated, and how its ravages may be prevented.”

As Ralph Waldo Emerson put it:

“Though love repose and reason chafe,

There comes a voice without reply.

‘Tis man’s perdition to be safe,

When for the truth he ought to die.”

In 1929, by an Act of Congress, Reed and all associates and volunteers at Camp Lazear, were awarded the Congressional Gold Medal. The inscription read: *In Recognition of the High Public Service Of Major Walter Reed, USA, and Associates, Who Gave To Man Control Of Yellow Fever, Feb 28, 1929.*

Legacy

Reed’s research at the beginning of a new century and the demonstration by Dr. Gorgas of the success of mosquito control in eradicating yellow fever in many parts of the world became legendary in science and the public’s mind. Movies, plays, and TV shows have sustained public interest in the martyrs and heroes. On Broadway, “Yellow Jack,” in 1934, featured Jimmy Stewart, and the Metro Goldwyn Mayer movie adaptation in 1938, starring Robert Montgomery and Virginia Bruce, are featured on Turner Classic Movies. Co-written by Sidney Howard, the Pulitzer and Oscar winning playwright and Paul de Kruif, a prominent microbiologist, the movie featured Walter Reed and his Yellow Fever Commission’s work.

Let me end by recounting some legacies of Walter Reed’s Yellow Fever Commission:

1. **The discovery of the mosquito vector** of yellow fever and the **filterable viral agent** that led to the development of yellow fever **vaccine** in 1932.
2. **The creation of the research that led to the most effective sanitation and mosquito-control programs in history.** All U.S. Soldiers were vaccinated for yellow fever in 1941; there were no reported deaths from yellow fever among U.S. troops in WWII.
3. **The first use of written informed consent** for human experimentation in U.S. history
4. **The establishment of the U.S. Army** as a major source of medical and public health research.
5. **The creation of a model for leadership** in organizing, and conducting biomedical research and applying results to prevent and control epidemics.
6. **The establishment of a sense of pride in America** for the martyrs and heroes: Nobel Prize winner, Dr. Hench said in 1948: “United in a common cause they

demonstrated magnificently the human capacity for greatness and courage. It is such as they who reassure us of the inherent decency and dignity of man.”

7. **Creation of the Walter Reed Army Hospital in 1905 that exists today in Bethesda as** Walter Reed National Military Medical Center(Sept 14, 2011)
8. Finally, some have suggested that a legacy of Reed’s Commission has yet to be realized: rapprochement between Cuba and the U.S. through mutual consensus and national pride over the major contributions of Cuban physician, Dr. Finlay, who proposed the mosquito theory of yellow fever and American Dr. Reed who proved it in 1900 to the benefit of humanity.

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Essay: "A fever when Walter came to Indianapolis"**

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B. Complete reference list (166) available upon request.

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Acknowledgments

Marcia Caudell, Manuscripts and Rare Books Division. Indiana State Library kindly addressed my questions and indicated that ISL has no manuscript material about Walter Reed.

Nancy L. Eckerman, Indiana University School of Medicine, Ruth Lilly Medical Library, Special Collections Librarian, History of Medicine and Nursing, provided invaluable assistance in researching archives for yellow fever research and the Walter Reed papers.

Suzanne Hahn, Director, Reference Services, Indiana Historical Society, Eugene and Marilyn Glick Indiana History Center, Indianapolis, Indiana, found no information regarding Walter Reed's visit to Indianapolis American Public Health Association Annual meeting Oct 22-26, 1900. She suggested the Hurty papers at the Indiana State Archives as a possible source.

Philip S. Hench Walter Reed Yellow Fever On-Line Collection is a remarkable international treasure of original documents in manuscript collections housed at the Claude Moore Health Sciences Library, University of Virginia. The papers focus primarily on the Yellow Fever Commission members and key superiors in the U.S. Army Medical Corps who were in charge of yellow fever research in Cuba circa 1900-01. <http://yellowfever.lib.virginia.edu/reed/>. Research into this history is all but impossible without accessing the Hench Collection.

Giles Hoyt, PhD, IUPUI Professor Emeritus German and Philanthropic Studies. Director emeritus, IUPUI, Max Kade German-American Center, kindly provided information regarding the history of the German House (Das Deutche Haus) which was renamed the Athenaeum in 1918 as result of anti-German feelings. Reed presented his historic research findings here in 1900.

Sjay 26 Jan 2014