

Medicine in Stamps

Walter Reed (1851–1902): on the cause of yellow fever

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In the late 19th century, yellow fever, popularly referred to as “black vomit,” was a scourge to both civilians and soldiers in the Americas by causing liver failure and gastrointestinal haemorrhage. Through somewhat controversial research, a US army surgeon named Walter Reed succeeded in deciphering its aetiology and prevention, and in the process, saved thousands of lives.

BEGINNINGS Born in Belroi, Virginia on September 13, 1851, Walter Reed was the youngest of five children. His was a religious family; his father, Lemuel Sutton Reed, was a Methodist minister and his mother, Pharaba White Reed, was a staunch Christian. At age 14, he began two years of serious study under former Confederate Army Lieutenant William Richardson Abbot, who instilled in the young man lifelong discipline and a fondness for learning. Reed then enrolled at the University of Virginia, receiving his medical degree at age 18, the youngest graduate in the school’s history.

During the following year, Reed pursued additional training at Bellevue Hospital College in New York, followed by stints at various hospitals in the city as a member of the Brooklyn Sanitary Commission. The bleak realities of big city slums depressed him and influenced his decision to enroll in the Medical Corps of the US Army. Reed’s first assignment was located near Long Island, New York, and the stability of this position permitted him to propose to one Emilie Lawrence, whom he married a year later. The young couple took in the charms and experiences of garrison life, living at various posts in Arizona before eventually moving to Omaha. They had two children, a son named Walter Lawrence and a daughter named Blossom.

THE SCIENTIST EMERGES However, the duties

of a frontier physician, mostly responding to routine sick calls by cattlemen, were mundane; so by 1890, the restless Reed undertook postgraduate studies at Johns Hopkins Hospital. There, he trained under the famous bacteriologist William Henry Welch and interacted with other giants in clinical medicine such as Osler, Halsted, Howell and Abel. His personal progress did not go unnoticed. His mentor, Welch would later say: “. . . we recognized that Reed possessed unusual aptitude for the work which he had undertaken; that he combined with excellent natural endowments of mind a sincere, manly, and winning personality.”

Reed’s initial research dealt with erysipelas and hog cholera bacillus, but this was cut short when his army posting took him to Fort Snelling, Minnesota, and later to Washington, DC. In 1893, he was appointed the Army Medical Museum’s curator and instructor of clinical microscopy at the Army Medical College. Finally, in 1900, Reed’s moment arrived when the army appointed him to head a commission to determine the cause of yellow fever.



CAUSE OF YELLOW FEVER The disease had taken a terrible toll on residents in the southeastern part of United States as well as on American soldiers stationed in Cuba. Fifty years earlier, Josiah Nott, a US physician, had postulated that the mosquito could somehow spread yellow fever, but his speculation was largely ignored. Three years before Reed’s assignment to Cuba, the Italian physician Giuseppe Sanarelli claimed to have found a bacterial cause for yellow fever, but this was shown to be erroneous. More importantly, Carlos Finlay, a Cuban physician, had amassed evidence in support of the mosquito theory, although his work, which was met with criticism, did not receive the recognition it deserved.

Impressed by the studies of Finlay, Reed became

convinced that the mosquito played a pivotal role. He arrived in Cuba with a group of physicians and conducted experiments on the cause of the disease. Yellow fever has no known animal model, so Reed and his colleagues were forced to use human subjects. Finlay assisted by supplying mosquitoes and mosquito eggs. Through a government grant, Reed built a laboratory and paid \$100 to each subject who volunteered to be bitten. An additional \$100 was paid if the volunteer contracted yellow fever. Although all the volunteers gave consent, no mention was made about compensation in the event of death. 22 volunteers came down with the disease; fortunately, none died. There was one fatality, however — Jesse Lazear, a physician member of the commission. Among other things, Reed observed that volunteers who slept in the same room with “infected” clothing and items did not get the disease, thus dispelling the notion that inanimate objects could spread yellow fever. In another experiment, Reed exposed two groups of volunteers to infected mosquitoes. One group was supplied with a protective mosquito screen, while the other was not. When the unprotected group developed the disease, the theory of a mosquito vector was all but confirmed. In 1901, Reed presented his groundbreaking results at the 28th Annual Meeting of the American Public Health Association in Indianapolis and at the Pan-American Medical Congress in Cuba.

In addition to demonstrating that the mosquito *Aedes aegypti* was a carrier of yellow fever, Reed described its natural history, including the acquisition of permanent immunity following prior infection. Later, Dr Carroll, a colleague, proved that a filterable agent present in blood and compatible with a virus, caused the disease. Even though a vaccine was not available for another 20 years, aggressive mosquito control as a result of the work of Carlos Finlay and Walter Reed dramatically reduced the incidence of yellow fever.

OTHER PURSUITS Reed also played a contributory role in the study of malaria, another disease with a mosquito vector. In 1896, an epidemic of malaria broke out at Fort Meyer, across the Potomac River and Washington Barracks. These locations were near breeding grounds for the *Anopheles* mosquito, which, at that time, was not recognised as the vector. In fact, it was believed that malaria was spread by “bad water”. However, Reed noted that nearby Washington residents were not affected even though they shared the same water source with the two military posts. The explanation was that biting

mosquitoes, and not drinking water, infected those unlucky enlisted men who wandered along the Potomac late at night.

ENDINGS Reed returned to his post as a professor after his triumph in Cuba and received an honorary Master of Arts from Harvard and Doctor of Laws from the University of Michigan. He was later appointed Librarian of the Surgeon General’s Library. Notwithstanding his important contributions, Reed was haunted by the ethics surrounding his human experiments. At one point, he wrote to a friend: “*The responsibility for the life of a human weighs upon me very heavily just at present, and I am dreadfully melancholic.*” He began complaining of fever and abdominal pain, which was diagnosed as chronic appendicitis. During surgery, the condition of his caecum was described as “hopeless”, and he developed peritonitis postoperatively. He died on November 23, 1902, at the young age of 51.

Walter Reed was buried at Arlington National Cemetery and posthumously elected to the Hall of Great Americans at New York University in 1945 — the first physician to be so inducted. The famous Walter Reed Hospital in Washington DC stands in tribute to his achievements, which are elegantly captured in his Harvard citation: “*Walter Reed, graduate in Medicine 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.*”

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