

# Fever and Reform: The Typhoid Epidemic in the Spanish-American War

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ALTHOUGH hostilities lasted only four months, the Spanish-American War led to significant reforms in military medicine. A defining event of the war was the typhoid fever epidemic of July to November 1898, which exposed the culpability of line officers and brought home to the army the supreme importance of sanitation. Typhoid fever was the major killer of American soldiers during the Spanish-American War, running rampant through the national encampments. Every regiment in the First, Second, Third, Fourth, Fifth and Seventh Army Corps developed typhoid fever. In all, 20,738 recruits contracted the disease (82 percent of all sick soldiers) and 1,590 died, yielding a mortality rate of 7.7 percent. Typhoid fever accounted for 87 percent of the total deaths from disease occurring in the assembly camps during the war (Table 1). The camps at home proved more deadly than the Cuban battlefields.

## TYPHOID FEVER

Typhoid fever, one of the great scourges of nineteenth-century armies, had a long history, and by the start of the war with Spain its symptoms, lesions, and causes had been identified. In the early decades of the century typhoid was one of the many diseases believed to arise from miasmas, the foul airs generated by putrefying animal and vegetable matter. English physician William Budd believed otherwise, and as early as 1839 described his theory that the causative agent of typhoid

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TABLE I

Morbidity and Mortality from Typhoid Fever among United States  
Army Recruits in the National Encampments from  
April to December 1898

Army camp	Location	Typhoid fever		Deaths from all diseases
		Cases	Deaths	
Thomas	Chickamauga, GA	10,339	761	866
Tampa	Tampa, FL	1,498	99	112
Alger	Falls Church, VA	2,226	212	259
Meade	Middletown, PA	2,690	150	168
Cuba Libre	Jacksonville, FL	3,985	368	427
Total		20,738	1,590	1,832

Note: Ninety-two regiments (107,973 officers and men) were studied. In the *Report on Typhoid Fever* the sum of deaths from typhoid fever is reported incorrectly as 1,580. Source: Reed et al., (n. 27) *Report*, I, 675.

spread through contaminated water supplies. When first published in 1859 Budd's ideas generated much attention and debate, and were still not fully accepted in the mid-1870s.<sup>1</sup>

Budd's work came just in time for possible application during the American Civil War. During that war army surgeon Joseph Janvier Woodward published his *Outlines of the Chief Camp Diseases of the United States Army*, the bible of the Union Army Medical Corps, in which he assessed Budd's evidence that typhoid was a contagious fever propagated by infected human dejections. Woodward concluded that the facts favored the opposite view, and that, in general, most army surgeons were likewise opposed to the contagion theory.<sup>2</sup>

1. Budd began his lifelong study of typhoid fever in July 1839, when an outbreak of the disease occurred in his hometown of North Tawton in Devonshire shortly after he entered into practice with his father. W. C. Rucker, "William Budd, pioneer epidemiologist," *Bull. Johns Hopkins Hosp.*, 1916, 27, 208-15. By the end of the year, Budd was a convinced contagionist. On 27 December 1839 he submitted an essay titled "On the causes and mode of propagation of the common continued fevers of Great Britain and Ireland" in competition for the Thackeray Prize awarded by the Provincial Medical and Surgical Association (forerunner of the British Medical Association). The striking similarities between his 1873 monograph and the 1839 essay reveal a continuity of ideas over a thirty-five year period. Dale C. Smith, ed., *On the Causes of Fever (1839) by William Budd* (Baltimore, Md.: Johns Hopkins University Press, 1984).

2. Joseph Janvier Woodward, *Outlines of the Chief Camp Diseases of the United States Army As Observed During the Present War* (Philadelphia: J.B. Lippincott, 1863), pp. 54-55. William Budd, "Intestinal fever essentially contagious. I. Intestinal fever, commonly called typhoid fever: mode of propagation. II. Nature of intestinal affection. III. Relation to defective sewerage," *Lancet*, 1859, 2: 4-5, 28-30, 55-56, 80-82, 131-33, 207-10, 432-33, 458-59.

Woodward was not merely being mulish; there were sound reasons for his resistance. Cases of typhoid fever had been encountered that could not be explained by Budd's theory, for he did not know that typhoid could also be spread by healthy carriers, flies, contaminated milk, and infected food. In addition, most practitioners still believed that fevers could originate spontaneously. Woodward acknowledged, however, that intestinal discharges of fever patients may be "more pernicious in their influence on the human system, as they are certainly more offensive than the healthy fecal discharges." Because noisome odors per se were believed to be unhealthy, Woodward stressed the importance of policing camp sinks (pit latrines).<sup>3</sup> Although we know that putrescent gases cannot produce the disease, Woodward inadvertently accomplished much by aiming to prevent the Augean stench. It is an example of what Fielding Garrison described as "the attainment of a sanitary end without definite sanitary intention." Budd offered a more pungent verdict, "The nose is wiser than the intellect it serves."<sup>4</sup> Clearly, Budd's ideas were windward of his hard-core anticontagionist contemporaries who believed that filth was the generator, not the vehicle, of disease.<sup>5</sup>

In 1873 Budd published his classic treatise on typhoid fever, which summed up nearly thirty-five years of careful clinical observations and thought on the subject.<sup>6</sup> Pierre Louis, the celebrated French pathologist who in 1829 named the continued fever then raging in Paris *la fièvre typhoïde*, had located its distinctive lesions in Peyer's patches, aggregates of lymph nodes in the small intestine.<sup>7</sup> Even though Louis noted that these lesions were always present in typhoid fever, and never present in any other disease, he failed to realize the significance of this morbid process in the transmission of the fever. By placing typhoid fever among the exanthemata, diseases character-

3. Woodward, (n. 2) *Camp Diseases*, pp. 49–50, p. 54.

4. Fielding H. Garrison, "The history of drainage, irrigation, sewage-disposal and water supply," *Bull. N. Y. Acad. Med.*, 1929, 5, 887–938, 889. William Budd, "On the fever at the clergy orphan asylum," *Lancet*, 1856, 2, 617–19, p. 618.

5. The filth or pythogenic theory was the major alternative to the doctrine of contagion, but it was not the only one. For a discussion of the various views of nineteenth-century anticontagionists, see Erwin H. Ackerknecht, "Anticontagionism between 1821 and 1867," *Bull. Hist. Med.*, 1948, 22, 562–93.

6. William Budd, *Typhoid Fever: Its Nature, Mode of Spreading, and Prevention* (London: Longmans, Green & Co., 1873; rpt., New York: George Grady Press, 1931).

7. Louis named the fever *typhoid*, because he believed it to be related to the typhus fever of Great Britain and Ireland. Leonard G. Wilson, "Fevers and science in early nineteenth century medicine," *J. Hist. Med. Allied Sci.*, 1978, 33, 386–407.

ized by continued fever accompanied by cutaneous eruptions (e.g., smallpox), Budd provided the insight required to link the anatomical changes with the clinical histories that implicated infected feces in the origin and spread of typhoid fever. The pocky gut was the mechanism by which the contagion spread.<sup>8</sup>

Constructing an analogy between the luminal surface of the intestine and the skin, Budd wrote "that this disease of the intestinal follicles is, in fact, a true *exanthema* of the bowel."<sup>9</sup> The typhoid lesion "is the specific eruption of the fever, and bears the same pathological relation to it which the small-pox eruption bears to small-pox."<sup>10</sup> In common with smallpox, typhoid fever was a specific, contagious disease that conferred life-long immunity after one attack. In addition, it had a definite incubation period, and its contagium was disseminated by a specific poison in the exudate that oozed from ruptured pustules.<sup>11</sup> Since, Budd reasoned, the specific typhoid poison was contained in the yellowish matter that was released from ulcerated intestinal follicles, diarrheal discharges were the vehicle for this morbid matter. "The sewer . . . is, so to speak, the direct continuation of the diseased intestine."<sup>12</sup>

Although he considered tainted air and water as the principal media for contagion, Budd recognized the important role contaminated hands played in disseminating the disease. To prevent the spread of

8. So striking was the physical resemblance between the pocky gut and smallpox lesions that French antivaccinationists argued that vaccination led to an internal eruption instead of an external one. In short, typhoid fever replaced smallpox. Lloyd G. Stevenson, "A pox on the ileum: typhoid fever among the exanthemata," *Bull. Hist. Med.*, 1977, 51, 496–504.

9. Budd, (n. 6) *Typhoid Fever*, p. 46. It was not the cutaneous rose-colored spots of typhoid fever that led Budd to the exanthemata analogy. Rather, it was the resemblance of the intestinal ulcers to the pustules that appear on the skin in smallpox. See Margaret Pelling, *Cholera, Fever and English Medicine 1825–1865* (Oxford: Oxford University Press, 1978), p. 250.

10. Budd, (n. 6) *Typhoid Fever*, p. 171. Gerhard had previously classified typhus among the exanthemata. W. W. Gerhard, "On the typhus fever, which occurred at Philadelphia in the spring and summer of 1836; illustrated by clinical observations at the Philadelphia Hospital; showing the distinction between this form of disease and dothineritis or the typhoid fever with alteration of the follicles of the small intestine," *Am. J. Med. Sci.*, 1837, 19, 289–322; 20, 289–322.

11. Smallpox (variola) and cowpox (vaccinia) inoculations were based on the principle that pustules contained specific contagia by which the disease was propagated. Budd, (n. 2).

12. Budd, (n. 6) *Typhoid Fever*, p. 39. Budd noted that the copious discharges of typhoid patients were bright yellow in color, and that "the yellow matter must bear the same relation to the specific poison of this fever which the pus corpuscles of the variolous pustule bear to the poison of small-pox." Budd, (n. 2), p. 209.

typhoid fever, Budd recommended thorough disinfection of all privies, drains, intestinal discharges at the moment of passage, body and bed linens before laundering, and the hands of anyone having contact with typhoid patients. With characteristic perspicacity, Budd understood the need for, and the difficulty in achieving, cooperation among the doctors, nurses, and other attendants to ensure success.<sup>13</sup>

Budd's findings had enormous implications for the military, since one could expect the severest outbreaks of typhoid fever under camp conditions where common latrines served as receptacles for the daily excreta of as many as 60,000 men, such as inhabited Camp Thomas during the Spanish-American War. Army sewage studies later determined that 60,000 men discharge an average of 9.4 tons of feces and 21,000 gallons of urine a day.<sup>14</sup> That posed a prodigious disposal problem! Typhoid fever was so prevalent in nineteenth-century America that among any large assembly of recruits from different parts of the country there would be some individuals already infected with the disease.<sup>15</sup> Within a one-to-two week incubation period after rendezvous, their stools provided the locus of typhoid pathogens that could be communicated to the alimentary canals of their susceptible comrades. Typhoid could never be totally eliminated from camp life. Yet epidemics could be prevented, even in situations where typhoid fever was imported into the camps, by strict adherence to the simple and inexpensive measures proposed in Budd's treatise. Budd admonished his colleagues: "I trust the time is not far distant when to allow these [dejecta] to pass into the cesspool or sewer in full possession

13. Budd listed several disinfectants (chlorinated lime, zinc chloride, chlorine water, iron sulfate, and carbolic acid) that were shown to be effective against typhoid fever and gave instructions for their preparation and use. Budd, (n. 6) *Typhoid Fever*, pp. 62, 96, 113–15, 126, 176–77.

14. Valery Havard, *Manual of Military Hygiene for the Military Services of the United States*, (New York: William Wood & Co., 1909), p. 330.

15. Typhoid fever mortality statistics for the principal small (population 50,000–100,000) and large (> 100,000) American cities and towns (6,000–25,000) from 1880 to 1906 show that typhoid fever was ubiquitous in the United States in the late nineteenth and early twentieth centuries. It was estimated that there were twelve to fifteen cases of typhoid for each death. George C. Whipple, *Typhoid Fever: Its Causation, Transmission and Prevention* (New York: John Wiley & Sons, 1908), pp. 274, 372–87, Appendix XVI and Table IX. When sewers replaced the cesspool-privy vault system of waste collection in the 1880s–1890s, raw sewerage disposal shifted to streams and rivers, creating health hazards for the populations downstream. As a result, typhoid fever deaths rose conspicuously in downstream communities that drew their drinking water from rivers polluted by upstream cities. Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, Ohio: University of Akron Press, 1996), pp. 111–30.

of their deadly powers will be looked upon, not merely as a careless, but as a highly culpable act.”<sup>16</sup>

George M. Sternberg, one of America’s leading bacteriologists, became surgeon general in 1893, a position he held through 1902. From his Civil War experience Sternberg realized that disease would probably be the leading cause of death of American soldiers in the impending conflict with Spain. He also understood that high morbidity and mortality rates from disease were not inevitable and could be checked by existing preventive measures. On 25 April 1898, the same day that Congress declared war, Sternberg issued Circular No. 1, which outlined the rules of personal hygiene and camp sanitation. Among his detailed instructions for strict sanitary police were the provisos that sinks should be dug before a camp is occupied, that all fecal matter in camp sinks should be covered with fresh earth or quicklime daily, that every man who fails to use the sinks should be punished, and that all discharges from fever patients should be disinfected immediately with solutions of carbolic acid or chlorinated lime. Had these recommendations been carried out, there would have been little sickness. Unfortunately, they were largely ignored, and typhoid fever rapidly overran the camps.<sup>17</sup>

Budd had recognized that typhoid fever was contagious and had even predicted the existence of a specific living organism as the etiological agent.<sup>18</sup> His prophesy was fulfilled in 1880, when Carl Eberth discovered typhoid bacilli in the spleen and Peyer’s patches using histopathological techniques. It was Georg Gaffky, a student of Robert Koch, who actually isolated and cultivated *Bacillus typhosus* (later renamed *Salmonella typhi*) in 1884.<sup>19</sup> By 1892 the following

16. Budd, (n. 6) *Typhoid Fever*, p. 62.

17. George M. Sternberg, *Sanitary Lessons of the War and Other Papers* (Washington, D.C.: Byron S. Adams, 1912), pp. 8–11.

18. Budd, (n. 6) *Typhoid Fever*, p. 93. In his 1839 essay Budd wrote, “The form of fever attended with specific lesion of the intestines . . . is caused by a Specific Virus. That if this Virus have any other source than the infected body, that source has not yet been discovered.” Smith, (n. 1) *Causes of Fevers*, p. 120.

19. Gert H. Brieger, “Carl Joseph Eberth,” in Charles Coulston Gillispie, ed., *Dictionary of Scientific Biography*, vol. 4 (New York: Charles Scribner’s Sons, 1971), 275–77. Georg Gaffky, “On the etiology of enteric fever,” in W. Watson Cheyne, ed., *Recent Essays by Various Authors on Bacteria in Relation to Disease* (London: New Sydenham Society, 1886), pp. 205–257. After being an invalid for seven years as a result of a stroke, Budd died in 1880 just as bacteriology was on the verge of validating his theory. Smith, (n. 1) *Causes of Fevers*, p. 144.

quite modern description of the typhoid bacillus could be found in Sternberg's *A Manual of Bacteriology*: a rod-shaped, motile, nonspore-forming, aerobic with peritrichous flagella. Colonies grown on gelatin or potato media have a yellowish-brown color similar to the exudate found in the intestines of typhoid patients. In addition, culture methods were described to distinguish the typhoid bacilli from similar microbes.<sup>20</sup>

Even skilled observers had difficulty in diagnosing typhoid fever in atypical cases in which the disease presented without its characteristic skin lesions (rose spots), when there were peculiarities in the symptomatology (no intestinal prodromata), or in cases of diseases that closely simulated typhoid (remittent malarial fever). In such instances, the Widal agglutination test revolutionized diagnosis.<sup>21</sup>

On 26 June 1896 Fernand Widal described his discovery of specific agglutinins in the blood of typhoid patients and its application in the diagnosis of typhoid fever before the Medical Society of the Paris Hospitals. Blood serum from a patient with typhoid fever caused exogenous typhoid bacilli to lose their motility and clump together.<sup>22</sup> William Osler reported favorably on the specificity of the Widal serum test. It was positive in 96 percent of 2,283 typhoid fever cases, and negative in 98 percent of 1,365 nontyphoid fever cases.<sup>23</sup> Widal himself and Acting Assistant Surgeon Charles F. Craig, chief of the bacteriology laboratory at Camp Thomas, reported similar results.<sup>24</sup>

Identification of the typhoid bacillus required specialized training in bacteriology, which few Americans possessed in 1898. Furthermore, it was difficult, even for one so trained, to distinguish between *Escherichia coli*, the common colon bacillus, and *B. typhosus*. There were no diagnostic laboratories in the assembly camps, or microscopes or men trained to perform the serodiagnostic test. Medical officers continued to base their diagnoses on clinical signs and symptoms, especially the

20. George M. Sternberg, *A Manual of Bacteriology* (New York: William Wood & Co., 1892), pp. 346–55.

21. William Osler, "The diagnosis of typhoid fever," *N. Y. Med. J.*, 1899, 70, 673–76.

22. Peter R. Hunter, "Fernand Widal," *Med. Hist.*, 1963, 7, 56–61. Fernand Widal, "On the sero-diagnosis of typhoid fever," *Lancet*, 1896, 2, 1371–72.

23. William Osler, *The Principles and Practice of Medicine. Designed for the Use of Practitioners and Students of Medicine*, 3rd ed. (New York: D. Appleton, 1898), p. 38.

24. Walter Reed, Victor C. Vaughan, and Edward O. Shakespeare, *Abstract of Report on the Origin and Spread of Typhoid Fever in U. S. Military Camps During the Spanish War of 1898* (Washington, D.C.: Government Printing Office, 1900), p. 64; Widal, (n. 22).

course of the patient's temperature and his reaction to quinine. Thus, if a patient with continued fever did not respond to quinine, the fever was *ipso facto* typhoid.

On the eve of the Spanish-American War it was not difficult to differentiate between typhoid fever and malaria. Osler's *Principles and Practice* provided the American practitioner with an easily assimilable picture of what contemporary scientific medicine knew about these afflictions. Yet, American medical officers continually misdiagnosed typhoid fever as malaria during the Spanish-American War.<sup>25</sup> In addition, a diagnosis of typhomalarial fever was resorted to as a wastebasket category when atypical cases presented difficulties, or to deny the existence of typhoid fever.<sup>26</sup>

By 1898 the causative agent of typhoid fever had been identified, the Widal serodiagnostic test was available, the mode of transmission via infected feces was established, and effective preventive measures (disinfection and scrupulous cleanliness) were known. The failure to protect the health of American soldiers who had never been near a battlefield became a national scandal. Why was typhoid fever, a preventable disease, the major killer of the war? Why was its morbidity rate higher than that observed during the first eight months of the Civil War, despite the advances in scientific medicine and public hygiene that had taken place in the interwar years? To answer these questions, Surgeon General Sternberg created the Typhoid Board. On 18 August 1898 a board of medical officers consisting of Majors Walter Reed, Surgeon, Regular Army (chairman); Victor C. Vaughan, Division Surgeon, U.S. Volunteers; and Edward O. Shakespeare, Brigade Surgeon, U.S. Volunteers, was charged to investigate "the cause of the extensive prevalence of typhoid fever in the various military camps within the limits of the United States. . . . The board will call the attention of the proper commanding officers to any insanitary conditions which may exist at the camps visited by it, and will make recommendations with a view to their proper correction."<sup>27</sup>

25. One volunteer medical officer even mistook rose spots (pathognomonic for typhoid) for insect bites. Reed et al., (n. 24) *Abstract*, p. 141.

26. Dale C. Smith, "The rise and fall of typhomalarial fever: I. Origins, II. Decline and fall," *J. Hist. Med. Allied Sci.*, 1982, 37, 182-220, 287-321.

27. Special Orders No. 194, AGO, 18 August 1898. Walter Reed, Victor C. Vaughan and Edward O. Shakespeare, *Report on the Origin and Spread of Typhoid Fever in U.S. Military Camps During the Spanish War of 1898*, 2 vols. (Washington, D.C.: Government Printing Office, 1904) I, xv.



All three men were well qualified for the task. Reed, professor of bacteriology and clinical microscopy at the Army Medical School, was an authority on the pathology of typhoid fever and had published on the diagnostic value of the Widal test in 1897; Shakespeare, an ophthalmologist and bacteriologist, had done impressive epidemiological work on the typhoid fever outbreak in Plymouth, Pennsylvania in 1885; and Vaughan, a pioneer in public health, had established the first hygiene laboratory in the United States that offered systematic training in bacteriology in 1889.<sup>28</sup>

#### THE REED-VAUGHAN-SHAKESPEARE TYPHOID BOARD

From 20 August to 30 September 1898, the board inspected all of the cantonments (Camps Thomas, Alger, Cuba Libre, and Meade), and also secondary camps to which troops had been transferred in an attempt to rid the commands of typhoid fever (Camp Poland, Knoxville, Tennessee; Camp Wheeler, Huntsville, Alabama; and the temporary encampment at Fernandina, Florida). An extra visit, not included in their original itinerary or in their final report, took place at Camp Wikoff at Montauk Point in Long Island, New York. After concluding their on-site inspections, the board returned to Washington and began a systematic analysis of the regimental and hospital sick reports of 107,973 officers and men who had not been outside of the United States. This herculean effort was completed twenty-one months later, in June 1900.

Because of Major Shakespeare's death on 1 June 1900 and Walter Reed's new assignment to the Yellow Fever Board, the job of preparing much of the *Abstract of Report on the Origin and Spread of Typhoid Fever in U. S. Military Camps During the Spanish War of 1898* (1900) fell to Victor Vaughan.<sup>29</sup> Despite the considerable demands on his time, Reed contributed a masterful essay to the *Abstract* titled "The

28. John A. Garraty and Mark C. Carnes, eds., *American National Biography*, 24 vols. (New York: Oxford University Press, 1999), XVIII, 282–84; XIX, 704–5; XXII, 299–301.

29. Two weeks after his fifty-fourth birthday, Shakespeare died suddenly from a heart attack. Anon., "Obituary of Edward Oram Shakespeare," *J. Am. Med. Assoc.*, 1900, 34, 1504. On 24 May 1900 (Special Orders No. 122, AGO) Walter Reed (Chairman), and contract surgeons James Carroll, Aristides Agramonte, and Jesse W. Lazear were ordered to proceed to Camp Columbia Barracks at Quemados, a town on the outskirts of Havana, Cuba, for the purpose of studying the infectious diseases prevalent on the island. Five days later Sternberg instructed Reed to give special attention to the question of the etiology and prevention of yellow fever. Reed arrived in Havana on 25 June. Philip S. Hench, "Conquerors of yellow fever," *Hygeia*, 1941, (Oct.), pp. 1–6.

Etiology of Typhoid Fever.”<sup>30</sup> In 1903 Congress appropriated funds to publish the full report, which appeared the following year in two large volumes, one of text and tabulations and the other of charts and maps. Once again the arduous task was shouldered by Vaughan, now the sole survivor of the board, since Reed had died on 23 November 1902.<sup>31</sup> *The Report on the Origin and Spread of Typhoid Fever in U. S. Military Camps During the Spanish War of 1898* (1904) is still the most complete study of the epidemiology of typhoid fever ever published. Presentation copies were sent to the war departments of the major world powers.<sup>32</sup>

Reed and his collaborators began their inspections in 1898 with several preconceptions about the epidemiology of typhoid fever, which were in harmony with the views of the best medical minds of the time: (1) typhoid fever was a specific disease entity caused by Eberth’s bacillus; (2) it was a waterborne disease; (3) it was not transmitted by other means, although flies were suspected; (4) it could be diagnosed while the patient was alive by the Widal test, and after the patient died by the presence of intestinal lesions; (5) malaria could be differentiated from typhoid by demonstrating plasmodia in the blood; (6) it was most prevalent among the least robust, especially those suffering from gastrointestinal disturbances; and (7) its mortality was greatest among those manifesting general weakness and gastrointestinal disturbances.<sup>33</sup> These ideas were subsequently confirmed (nos. 1, 4, and 5), modified (nos. 2 and 3) or refuted (nos. 6 and 7) by the board’s investigations.

The board’s initial inspections at Camp Alger revealed hundreds

30. Presumably this was written during August 1900 when Reed had returned to Washington under orders to join Vaughan in completing the report on typhoid fever. On 7 September 1900 Reed wrote to James Carroll, “*The Typhoid Report is on its way to the upper office*” [Reed’s italics]. Theodore E. Woodward, William R. Beisel, and Roy D. Faulkner, “Marylanders defeat Philadelphia: yellow fever updated,” *Trans. Am. Clin. Climatol. Assoc.*, 1976, 87, 69–101, p. 85. Impatient to continue the yellow fever work, Reed was back in Cuba on 4 October 1900.

31. Walter Reed died at 51 years of age, six days after an appendectomy performed by his close friend William C. Borden. W. C. Borden, “History of Doctor Walter Reed’s illness from appendicitis,” *Wash. Med. Ann.*, 1903, 1, 425–426. On 16 March 1905, Borden wrote to Howard A. Kelly that Reed’s case was “a particularly trying one to me for the reason that I was a great personal friend of Dr. Reed’s . . . [and] in that it is the only operative case of appendicitis which I have ever lost.” Daniel L. Borden, “William Cline Borden 1858–1934,” *Med. Ann. D. C.*, 1936, 5, 269–75, 310–18, p. 311.

32. Victor C. Vaughan, *A Doctor’s Memories* (Indianapolis: Bobbs-Merrill, 1926), pp. 392–93.

33. *Ibid.*, pp. 369–70.

of cases which they suspected to be typhoid fever, but which had been diagnosed as malaria by the attending physicians. Since men who recovered from these so-called "malarial" attacks appeared to be immune to subsequent bouts of typhoid fever, the disease had to be typhoid and not malaria.<sup>34</sup> Adding to the problems of misdiagnosis was "the bogie of typhomalaria which . . . had been accepted as a reality by many of the best in the profession."<sup>35</sup> The immediate objective, therefore, was to determine the true nature of the disease. Reed and his colleagues petitioned Surgeon General Sternberg to establish properly equipped diagnostic laboratories in each camp, and he quickly complied. Well-trained bacteriologists—James Carroll, Charles Craig, and George Dock—who were skilled at performing the Widal test, preparing blood smears, and identifying plasmodia under the microscope, rendered invaluable service in establishing the true identity of the fever afflicting American recruits. Only 1 percent of the cases examined proved to be malaria; the rest were typhoid.<sup>36</sup> The board concluded that "the fever so prevalent in our military camps during the late Spanish war, and which was diagnosed by the majority of medical officers as malarial remittent or typhomalarial fever, was none other than typhoid fever."<sup>37</sup>

Misdiagnosed cases had much to do with the spread of typhoid fever in the camps in 1898. Surgeon General Sternberg concluded that "failure to make an early diagnosis, mistaking typhoid fever for malarial fever, led very largely to the camp infection."<sup>38</sup> Although the board clearly stated that army surgeons showed no greater incapacity to recognize typhoid than did their civilian counterparts, the *Abstract on Typhoid Fever* and *Report on Typhoid Fever* were widely perceived as an indictment against the efficiency of the Army Medical Corps. Since medical officers went into the southern camps expecting to encounter nothing but malaria, they found what they were looking for. By overdosing some patients with quinine, these surgeons further clouded the issue; now they faced typhoid cases aggravated by cincho-

34. Reed et al., (n. 24) *Abstract*, pp. 95, 99.

35. Vaughan, (n. 32) *Doctor's Memories*, p. 371.

36. U. S. Congress, Senate. *Report of the Commission Appointed by the President to Investigate the Conduct of the War Department in the War With Spain*, 8 vols., 56th Cong., 1st sess., Senate Document 221 (Washington, D.C.: Government Printing Office, 1900) [hereafter *Dodge Commission Report*], IV, 832.

37. Reed et al., (n. 24) *Abstract*, p. 167.

38. *Dodge Commission Report*, (n. 36) VI, 2822.

nism.<sup>39</sup> Who was responsible for this widespread error in diagnosis? Osler placed the responsibility for the prevailing ignorance with the medical schools. "The fault lies in reality with the system of teaching which permitted these young men to go out into practice without a thorough knowledge of typhoid fever." At the time, the quality of American medical schools ranged widely, and training in laboratory skills was still the exception. Only a small percentage of medical officers had the advantage of top quality clinical and laboratory experience.<sup>40</sup>

The board concluded that camp pollution was the greatest sin committed by the troops at the national encampments in 1898 and that the proper disposition of human excreta was the *sine qua non* for maintaining the health of a command. "Wherever and whenever men congregate and live without adequate provision for disposing of their excrement, there and then typhoid fever will appear."<sup>41</sup> This statement in no way endorsed the theory of the *de novo* origin of the disease. To the contrary, the board's investigation supported Budd's doctrine that typhoid fever was a specific disease caused by a specific germ, "and no amount of decomposing matter in which this organism is not present can cause the disease."<sup>42</sup> Distinct microbes had thoroughly and completely supplanted indistinct miasmas and dirt as the acknowledged culprits.

Despite the continual protests of medical officers, line officers and recruits neglected sanitation. Inexperienced volunteer officers, anxious to be popular with the enlisted men, were particularly lax in enforcing discipline. Unrestrained, headstrong recruits obeyed only those orders they considered unobjectionable. Discipline was the key; without it sanitary regulations could not be enforced.<sup>43</sup> Medical

39. Reed, *et al.*, (n. 24) *Abstract*, p. 62; Victor C. Vaughan, "Typhoid fever among the American soldiers in the recent war with Spain," *J. Mil. Serv. Instn. U. S.*, 1899, 25, 85-88. This was a classic instance where the "poor, miserable patient has the disease and the doctor both to fight." Basil M. Taylor, "The practical treatment of typhoid fever," *J. Mil. Serv. Instn. U. S.*, 1899, 25, 426-34, p. 427.

40. Osler, (n. 21), p. 675. For a comprehensive account of medical education in nineteenth-century America, see Kenneth M. Ludmerer, *Learning to Heal: The Development of American Medical Education* (New York: Basic Books, 1985).

41. Reed *et al.*, (n. 27) *Report*, I, 662.

42. *Ibid.*, p. 667.

43. "Nothing . . . so distinctly marks ill-disciplined troops as soil-pollution by human waste, and apart from its intrinsic nastiness it is a powerful factor in the spread of disease." Alfred A. Woodhull, *Notes on Military Hygiene for Officers of the Line. A Syllabus of Lectures*

officers had to contend with the enlisted man's ignorance or willful violation of the most ordinary rules of health: "A reckless recruit will drink the water which has been condemned as unsafe, and at night will defile the ground in the vicinity of his tent rather than visit the company sink, which, possibly, is in a disgusting and unsanitary condition because of a failure to carry existing orders into effect."<sup>44</sup> At Camp Thomas the board found

the sinks full to the top with fecal matter; soiled paper was scattered about the sinks, and the woods behind the regimental camp was strewn with fecal matter. . . . fecal matter was deposited around trees, and flies swarmed over these deposits not more than 150 feet from company mess tents; the odor in the woods just outside of the regimental lines was vile.<sup>45</sup>

These words are reminiscent of those written three decades earlier by Surgeon Woodward when describing the atrocious sanitary conditions in Union Army camps.<sup>46</sup> The sanitary lessons of the Civil War had been forgotten.

Volunteer troops were the greatest offenders. Regular Army veterans knew how to care for themselves and paid closer attention to sanitation. They were more conscientious than the green recruits in using company sinks and were not guilty of defecating promiscuously about the surrounding countryside.<sup>47</sup> The nucleus of seasoned veterans was too small, however, to teach the mass of volunteers self-reliance. It took more time than there was "with only a little leaven to leaven the whole loaf."<sup>48</sup>

Unthinking, venturesome recruits disseminated typhoid in ways so furtive that their detection required almost Sherlock Holmesian

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*Formerly Delivered at the U. S. Infantry and Cavalry School*, 3rd ed. (New York: John Wiley & Sons, 1906), p. 121.

44. U. S. Congress, House of Representatives. *Report of the Surgeon-General*, in *Annual Reports of the War Department*, 56th Cong., 1st sess., House Document 2, Vol. 1, Part 2 (Washington, D.C.: Government Printing Office, 1899) [hereafter ARSG 1899], p. 623.

45. Reed et al., (n. 24) *Abstract*, p. 47. For eyewitness accounts of the fetid conditions of the sinks and/or the neglect of sanitation by the officers and enlisted men in the national encampments, see the *Dodge Commission Report*, (n. 36) III, 261, 313-14, 547, 701-3; IV, 842, 848, 868, 968, 1043-44, 1088, 1091, 1137, 1142, 1334, 1357-58, 1459, 1525; V, 1590, 1656, 2150; VII, 3304.

46. Woodward, (n. 2) *Camp Diseases*, pp. 49-50.

47. For comparisons of the attitudes and behaviors of the Regular Army veterans and the raw U. S. Volunteer recruits, see *Dodge Commission Report*, (n. 36) III, 395; IV, 868, 1320, 1503; V, 1596-97.

48. *Dodge Commission Report*, (n. 36) V, 1783.

skills. Such was the case of a soldier who left camp without permission by hiding in an empty barrel on a wagon on its way to replenish the camp's water supply. A subsequent inspection of his regimental camp site revealed conditions which made it impossible for the soldier's shoes to be free from contamination.<sup>49</sup> Once the barrels were returned to camp, men with unclean hands dipped unclean cups into them and drank the water. The chances of imbibing contaminated water and spreading the disease in this manner were not insignificant.

The board argued that the line officers must accept blame for the unsanitary conditions of the camps. "Camp commanders should regard proper attention to the sanitation of the site occupied by their troops as one of their highest duties and its neglect as a crime."<sup>50</sup> Viewed as outsiders, medical officers' recommendations were commonly disregarded as contemptible intrusions from inferiors. In a foolhardy display of bravado, a corps commander deliberately drank water every day from a well condemned by the medical officer. Fortunately, for the line officer, he did not come down with a fever. Presumably, he was immune to typhoid, having doubtlessly drunk polluted water for much of his army life.<sup>51</sup> "The medical officer can only recommend; the line officer can command. We think it unfortunate that hygiene is not taught in our national military school." Since the reform of line officers was a difficult and long-term objective, the board sought a quicker solution: give medical officers greater authority in all matters relating to military hygiene.<sup>52</sup> This never happened.

History is rarely simple, and never one-dimensional. Not all line officers were delinquent in their duty to protect the health of their men, nor were all medical officers diligent in promoting camp hygiene. A colonel commanding the Twelfth Pennsylvania Infantry at Camp Alger posted sentinels at every latrine and ordered each soldier to cover his stools with earth immediately after evacuating. Each

49. ARSG 1899, (n. 44), p. 625.

50. Reed et al., (n. 27) *Report*, I, 672. It was the line officers' responsibility to put a stop to promiscuous defecation, but they did not seem to care what the men did. *Dodge Commission Report*, (n. 36) IV, 843.

51. Vaughan, (n. 32) *Doctor's Memories*, p. 376.

52. Reed et al., (n. 27) *Report*, I, 664. One farsighted army surgeon took reform a step further when he recommended that noncommissioned officers receive similar instruction, since they were the ones in constant contact with the soldiers. C. L. Heizman, "The sanitary sergeant," *J. Mil. Serv. Instrn. U. S.*, 1897, 20, 540-46.

soldier leaving the sink was also compelled to wash his hands with soap and water.<sup>53</sup> Furthermore, regimental surgeons were required to instruct the enlisted men on the insidious nature of typhoid and how it spread, so that “the good sense of the men, rather than the severity of their superiors, may be relied upon to accomplish the object of this order.”<sup>54</sup>

Many volunteer surgeons and their civilian counterparts, contract surgeons, possessed little or no knowledge of military hygiene or the practice of military medicine. Unlike Regular Army surgeons, they were not required to pass rigorous entrance examinations to establish their competence. The surgeon in charge of the divisional hospital at Camp Poland in Knoxville, Tennessee, for example, was ignorant of the necessity for disinfecting the stools, clothes, and bedding of typhoid patients. Bedpans containing untreated waste were kept in the wards for inordinate lengths of time, and then carelessly dumped into nearby sinks without regard for polluting the surrounding area. Untrained orderlies, wholly ignorant of sanitary principles and not properly supervised by the attending surgeons, cared for typhoid patients and then returned to their regiments without disinfecting or even washing their hands. At the mess table they would handle food, undoubtedly infecting themselves and their comrades. They were a menace to the entire command.<sup>55</sup>

To combat these problems, the board recommended the routine disinfection of the stools, urine, bedding, and personal linen of all hospital patients to prevent the spread of infection. Specifically, they instructed that a solution consisting of one part of carbolic acid to thirty parts of water be prepared in advance in large quantities. A pint of the disinfectant solution was to be added to every bedpan before it received a patient’s discharge. Further, after each stool, the patient’s buttocks had to be carefully cleansed with this solution. The hands of all personnel attending typhoid patients had to be disinfected before coming into contact with healthy people.<sup>56</sup>

Despite the best of intentions, sometimes it was impossible to

53. Reed et al., (n. 24) *Abstract*, p. 87. The First West Virginia Infantry dubbed this regulation the “famous cat law,” because “every man had to scratch earth over his discharges.” *Dodge Commission Report*, (n. 36) IV, 919.

54. General Order No. 65 issued 11 August 1898. *Dodge Commission Report*, (n. 36) III, 221.

55. Reed et al., (n. 24) *Abstract*, pp. 47, 51, 129.

56. *Ibid.*, pp. 49, 92.

adhere to these directives. Surgeon Frank W. Hendley complained that he could get only two bedpans for nearly sixty patients, and that disinfectants could not be kept standing in the bedpans because they were used so frequently.<sup>57</sup> Failure to carefully disinfect all excreta and the hands of all attendants after contact with typhoid patients were unquestionably major factors in the propagation of the disease.

Establishing the method of transmission of a disease has been shown to be more important to preventive medicine than identifying its causative agent.<sup>58</sup> Typhoid fever was no exception. Even though the typhoid bacillus had been identified twenty years before the Spanish-American War, ignorance of the manner in which the disease was disseminated hindered effective preventive action. Although the board had entered upon its duties believing that typhoid fever was an exclusively waterborne disease, their investigations revealed the greater importance of other causes. In cases where soldiers and civilians shared a common source of drinking water, recruits became sick, yet there was no typhoid among the civilian population.<sup>59</sup> Further, in each company certain tents were badly infected, while inmates of adjoining tents—living under the same conditions, sharing the same water supply, and eating the same food—wholly escaped. Human contact, direct and indirect, was determined to be the predominant means of spreading the infection in the military camps (Table 2): “Man himself is the most active agent in the dissemination of this disease.”<sup>60</sup> The careless soldier unconsciously carried typhoid bacilli in his digestive tract, urinary bladder, or on his hands, shoes, and clothing. The whole process was a case of self-inflicted germ warfare.

While the board understood that the stools of individuals sick with typhoid fever constituted the principal source of the infection, they unequivocally recognized the existence and significance of the carrier state.<sup>61</sup> In the *Abstract on Typhoid Fever*, published in 1900, Reed, Vaughan, and Shakespeare noted:

Indeed, it is quite certain that an individual may become the bearer and distributor [*sic*] of the infecting agent of typhoid fever without developing

57. *Dodge Commission Report*, (n. 36) IV, 1333. Hendley's experience was not an isolated event. Bedpans were at a premium at many other hospitals. *Ibid.*, V, 1701, 2248.

58. Havard, (n. 14) *Manual*, p. xii.

59. Vaughan, (n. 39).

60. Reed et al., (n. 24) *Abstract*, p. 210.

61. In 1839 Budd described a case that may be interpreted as a typhoid carrier. “I have knowledge of one instance in which it was quite certain that fever was communicated by



TABLE 2

The Epidemiology of Typhoid Fever Occurring  
among United States Army Recruits during the  
Spanish-American War

<i>Mode of transmission</i>	<i>Percentage of cases</i>
Contact	62.8
Flies	15.0
Waterborne and airborne	22.2
Total	100.0

Source: Vaughan, (n. 32) *Doctor's Memories*, pp. 393–94.

the disease himself. . . . The specific germ of this disease may be transported from one place to another in the intestines of an immune man, and when cast out in the stools may become a source of danger to others. It is probably in some such way as this that epidemics of typhoid fever sometimes appear to originate de novo.<sup>62</sup>

The importance of this discovery cannot be overestimated. At the time there was a widespread belief that harmless intestinal bacteria could, in the presence of decomposing feces or organic matter, evolve into typhoid bacilli. This hypothetical, filth-generated transformation was devised to explain typhoid outbreaks that could not be traced to antecedent cases. The carrier concept refocused attention on specific pathogens that bred true over generations and on the essentiality of preexisting cases in the spread of typhoid.<sup>63</sup>

To eradicate typhoid fever required the destruction of all typhoid bacilli as they exited from the body. Therefore, to avoid the risk from

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a person far advanced in convalescence. To what length of time this power may extend we cannot at present form a probable conjecture." Smith, (n. 1) *Causes of Fever*, p. 83.

62. Reed et al., (n. 24) *Abstract*, p. 202. In 1907 an Irish immigrant cook, Mary Mallon, the infamous "Typhoid Mary," became the first healthy typhoid carrier to be identified and carefully documented in the United States. Judith Walzer Leavitt, *Typhoid Mary: Captive to the Public's Health* (Boston: Beacon Press, 1996). Osler did not mention typhoid carriers until the seventh edition of his textbook. William Osler, *The Principles and Practice of Medicine. Designed for the Use of Practitioners and Students of Medicine*, 7th ed. (New York: D. Appleton & Co., 1909), p. 62.

63. A. A. Woodhull, *Notes of Congress of Hygiene and Demography, London, 1891* (Trenton, N.J.: John L. Murphy, 1892), pp. 19–23; Sternberg, (n. 20) *Manual of Bacteriology*, pp. 350–51. Reed was predisposed to a carrier state because of his familiarity with Sternberg's demonstration of its existence in pneumococcal infections. Martha L. Sternberg, *George Miller Sternberg* (Chicago: American Medical Association, 1920), pp. 73–87.

unsuspected carriers, the board recommended that all excreta, from both sick and well, should be considered dangerous and be thoroughly disinfected.<sup>64</sup> This was sensible advice, since it was impossible at the onset of symptoms to distinguish typhoid from a case of uncomplicated diarrhea.

Vaughan was rightfully distressed when the board's discovery that typhoid was largely transmitted by human contact was later attributed to Robert Koch, whose work during the 1902 typhoid outbreak in the German city of Trier was not published until the following year.<sup>65</sup> This error is perpetuated in the definitive modern biography of Koch, which also credits him with originating the concept of healthy typhoid carriers in 1903.<sup>66</sup> Others too have shortchanged Reed and his colleagues regarding priority, going so far as to claim that the idea of carriers "was not even hinted at in the report of the board." Some admitted that the board knew about carriers, but believed that they failed to appreciate their importance.<sup>67</sup>

Next to personal contact, flies were shown to be the most active agents in the spread of typhoid in the national encampments in 1898. "To those who have seen flies feeding upon fecal matter smeared over the buttocks of patients or have seen them crawling into the mouths of the unconscious typhoid subject, nothing more is necessary than to mention this possible means of the dissemination of the disease."<sup>68</sup> Numerous accounts mentioned that clouds of flies swarmed around the sinks, and often alighted on the excrement before an

64. Reed et al., (n. 24) *Abstract*, p. 203. Early studies estimated that 2–6 percent of typhoid sufferers became chronic carriers. William H. Park, "Typhoid bacilli carriers," *J. Am. Med. Assoc.*, 1908, 51, 981–82. Most chronic carriers are now known to be elderly women with gallbladder disease, who can shed up to a billion typhoid bacilli per milliliter of bile. Wolfgang K. Joklik, Hilda P. Willett, D. Bernard Amos, and Catherine M. Wilfert, eds., *Zinsser Microbiology*, 20th ed. (Norwalk: Appleton & Lang, 1992), p. 562; Gerald L. Mandell, R. Gordon Douglas, Jr., and John E. Bennett, eds., *Principles and Practice of Infectious Diseases*, 2nd ed. (New York: John Wiley & Sons, 1985), p. 1265.

65. Vaughan, (n. 32) *Doctor's Memories*, p. 393.

66. Thomas D. Brock, *Robert Koch. A Life in Medicine and Bacteriology* (Madison, Wis.: Science Tech Publishers, 1988), pp. 255–56.

67. Merritte W. Ireland, "A fighter for the cause of health. The military record of Colonel Victor C. Vaughan," *J. Lab. Clin. Med.*, 1930, 15, 878–84, p. 880. W. D. Tigertt, "The initial effort to immunize American soldier volunteers with typhoid vaccine," *Mil. Med.*, 1959, 124, 342–49.

68. Reed et al., (n. 24) *Abstract*, p. 231. For eyewitness accounts of flies and maggots crawling over the bodies and faces of hospitalized typhoid patients, see *Dodge Commission Report*, (n. 36) III, 514; IV, 1303, 1322, 1434; V, 1710, 1766, 2071.

individual had finished defecating.<sup>69</sup> Major Guy L. Edie, the sanitary inspector at Camp Thomas, reported that after latrines were sprinkled with quicklime, flies with whitened feet were observed walking on food in the mess tents.<sup>70</sup> The aerial route from the sink to the kitchen, Surgeon Alfred A. Woodhull observed, became “a literal highway of disease.”<sup>71</sup> Flies were such a nuisance that men “ate with one hand and fought flies with the other.”<sup>72</sup> Since the board’s statistics revealed that the incidence of typhoid was lower among recruits who ate in screened tents, they recommended that measures be taken to prevent flies from coming into contact with food.<sup>73</sup> Typhoid died out in the fall, coincident with the seasonal disappearance of flies. On 28 October 1898 Craig reported on his laboratory experiments at Camp Thomas and confirmed the hypothesis that the common housefly could carry typhoid. He retrieved pure cultures of typhoid bacilli from the feet and dejecta of flies that had free access to a mixture of sugar and typhoid germs.<sup>74</sup> The evidence against the dipterous insect was so impressive that *Musca domestica*, long accepted as an annoying but harmless fact of life, was thereafter dubbed “the typhoid fly.”<sup>75</sup>

Making practical use of this knowledge about the “typhoid fly” for the benefit of hospitalized patients was another matter. Attempts to use mosquito netting as fly screens for individual beds at the Camp Thomas hospital proved impracticable. The beds were crowded so closely together that nurses and patients regularly got entangled in the meshwork and tore holes in it.<sup>76</sup>

Reed and his colleagues began their investigations believing that typhoid fever would be most prevalent among those who were fre-

69. Reed et al., (n. 24) *Abstract*, p. 181; *Dodge Commission Report*, (n. 36) III, 77, 79, 314, 547; IV, 998; V, 1597, 1809, 2069, 2071, 2181; VII, 3304.

70. Reed et al., (n. 24) *Abstract*, p. 24.

71. Alfred A. Woodhull, *Military Hygiene for Officers of the Line*, 4th ed. (New York: John Wiley & Sons, 1909), p. 313.

72. *Dodge Commission Report*, (n. 36) IV, 919. Corporal Joseph Gurke attested that when he had charge of the kitchen at Camp Thomas, “There were millions of flies. . . . We couldn’t keep the meat clean. It was covered with these flies.” *Ibid.*, V, 2181.

73. Reed et al., (n. 24) *Abstract*, p. 48.

74. *Dodge Commission Report*, (n. 36) IV, 837.

75. Vaughan, (n. 32) *Doctor’s Memories*, p. 385. Others had speculated that flies were involved in the spread of typhoid fever (see J. C. Battersby’s papers “Waterborne typhoid,” *Br. Med. J.*, 1895, 2, 393, and “Chitral relief force,” *Br. Med. J.*, 1895, 2, 1526), but it was the Reed-Vaughan-Shakespeare board that proved it.

76. *Dodge Commission Report*, (n. 36) IV, 1312.

quently in poor health. Surprisingly, typhoid was almost wholly confined to those in robust health and rarely occurred among the frail. In disbelief, Vaughan searched the old literature, and found that similar observations had been made during the typhus epidemics in Ireland.

One old writer . . . wrote that the disease went through a community, much as you or I would go through a flock of sheep, picking out the 'handsomest, healthiest and lustiest.' So our discovery turned out to be nothing more than [*sic*] the picking up of lost facts . . . diseases do not improve the race by killing off the unfit as Herbert Spencer believed, but like war, they destroy the best in the nation.<sup>77</sup>

Typhoid took the flower of America's youth, whose tragic loss is, as historian Stephen Ambrose noted, the immeasurable cost of every war.<sup>78</sup>

#### TENSION BETWEEN MEDICAL OFFICERS AND LINE OFFICERS

Although their approaches differ, medical officers and line officers should have the same goal; namely, to conserve the fighting strength of the army. Safeguarding the health of troops is crucial for the success of any campaign. Wars are won by able-bodied combatants; sickness causes an enormous drain on the army's resources, and compromises its fighting power.<sup>79</sup> The 20,738 cases of typhoid fever that occurred during the Spanish-American War equaled the loss of the services of 20 regiments of infantry. Why, then, were medical officers and line officers at odds? Why was there "an immense amount of friction between the headquarters and the surgeons," as Captain Francis P. Fremont, a line officer with the Second United States Infantry at Camp Thomas, maintained in sworn testimony before the Dodge Commission?<sup>80</sup> Chaired by Major General Grenville M. Dodge, a Civil War hero, this commission of distinguished civilians and military officers was appointed after the war by President McKinley to investigate charges of criminal neglect of the soldiers in the disease-ridden encampments.

Tension between medical officers and line officers arose from a

77. Vaughan, (n. 32) *Doctor's Memories*, pp. 395–96.

78. Stephen E. Ambrose, *Americans at War* (Jackson: University Press of Mississippi, 1997), p. xi.

79. Typhoid fever was the enemy's ally. The average length of disability from typhoid fever was 66 days ( $n = 326$  soldiers). Reed et al., (n. 24) *Abstract*, p. 114.

80. *Dodge Commission Report*, (n. 36) III, 715.

number of circumstances, causing a rift that proved, in the long run, to be detrimental to the welfare of the army. Line officers consistently underestimated the deadliest of all enemies, infectious disease, and paid mere lip service to camp sanitation. Major George T. Lorigan testified that his regiment dug no sinks for at least ten days after their rendezvous at Camp Thomas. A thousand men were compelled to relieve themselves in the surrounding woods, yet none of the company officers protested the lack of sanitary arrangements.<sup>81</sup> In short, their actions were inimical to the health of the army, and acted like a boomerang, defeating their original aim of building a cohesive fighting unit.

Line officers dismissed many of the medical officers' recommendations as unrealistic and unnecessary fads. The army, they argued, was not a church picnic. Sacrifice, privation, suffering, and neglect were inevitable and came with the territory. Real soldiers had no expectations of being pampered with feather beds and lamb chops. Instead, they were expected to endure the hardships of camp life without complaint, but with a certain amount of pride. "You have got to get camp fevers with camp experience just as much as a child gets teeth," exclaimed Major General Joseph C. Breckinridge.<sup>82</sup> Military commanders never understood that much of the suffering they took for granted was needless and preventable. Further, they failed to appreciate that they stood *in loco parentis* toward their young men, and were "the guardians and protectors, as well as the rulers, of the rank and file."<sup>83</sup>

In performing their duty, medical officers were sometimes perceived as whistle blowers with ulterior motives and treated harshly by their superiors. On 16 July 1898, Surgeon John Martin was threatened with a court-martial unless he retracted his claim that typhoid fever was approaching epidemic proportions at Camp Thomas. Although expressing displeasure with headquarter's suppression of the facts, Martin caved in under pressure and recanted.<sup>84</sup> Subsequent events showed that Martin was right.

81. *Ibid.*, V, 2063.

82. *Ibid.*, V, 1781.

83. Woodhull, (n. 71) *Military Hygiene*, p. 2.

84. *Dodge Commission Report*, (n. 36) IV, 915; VI, 3009–12. When confronted with another devastating report on unsanitary conditions at Camp Thomas, Major General John R. Brooke huffed, "If you give me a copy of that report, I will see that that young man

Senior line officers offered the excuse that they were too busy with matters of military necessity to squander their time and energy on such mundane questions as the proper location of company sinks. Such concerns had to be delegated to subaltern officers, they pleaded, who may not have followed orders to the letter, allowing conditions to deteriorate. There was some truth to this allegation. Since most company and regimental officers and noncommissioned officers were Civil War veterans, a Civil War mentality permeated the army.<sup>85</sup> Besides its adverse effects on purely military aspects of war (e.g., tactics), the Civil War mindset had dire consequences for the health of American troops during the Spanish-American War. Line officers had seen how powerless army surgeons were against disease and infection, and were not eager to implement medical officers' recommendations for preventive health measures. Company commanders often failed to enforce sanitary regulations; the lack of discipline, especially among the volunteer regiments, was scandalous. Line officers did not appreciate the need for sanitary inspections or for the isolation of known cases of typhoid fever. An enlisted man who was accidentally shot was placed in the same tent with men suffering from typhoid fever.<sup>86</sup>

Many medical recommendations went unheeded, including boiling drinking water, covering sinks to reduce the fly population, disinfecting or burning kitchen rubbish, and using additional hospital tentage to relieve overcrowding.<sup>87</sup> On 17 July 1898, Surgeon Albert J. Hartsuff made several recommendations to reduce the mounting sickness at Camp Thomas. The flippancy of the commanding general's response is further evidence that physicians' recommendations were commonly disregarded as contemptible intrusions from inferiors: "I did not regard his letter in a very serious sense. . . . He caused me more trouble and annoyance than anyone ever did." Brigadier General Henry V. Boynton, commandant of Camp Thomas, confessed that

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[Surgeon James Parker] goes before a court-martial for the sort of statements he has made there." *Ibid.*, VI, 3081.

85. P. M. Ashburn, *A History of the Medical Department of the United States Army* (Boston: Houghton Mifflin Co., 1929), p. 127.

86. Mary C. Gillett, *The Army Medical Department, 1865–1917* (Washington, D.C.: Center of Military History, United States Army, 1995), p. 4; *Dodge Commission Report*, (n. 36) III, 77, 145, 159–60, 162, 261, 316; IV, 1315.

87. *Dodge Commission Report*, (n. 36) IV, 1036, 1143; V, 1817–19, p. 1823.

his line officers "did not pay that attention to the sanitation of the camp that officers that had had opportunities to learn about doing these things would have done."<sup>88</sup>

Line officers were jealous of their right to command and had difficulty accepting advice from subordinates whom they regarded as attached to, rather than as an integral part of, the military hierarchy. Officers of the line perceived medical duties as wholly clinical; that is, doctors restored the health of the sick and disabled. The idea that healthy men were as worthy of their attention as sick men was inconceivable. Therefore, attempts on the part of medical officers to interfere with the daily activities of healthy soldiers (to prevent illness) came dangerously close, in the line officers' eyes, to usurping their command.<sup>89</sup>

The army doctor was given full control over caring for the sick; however, when it came to the broader question of military hygiene and the preservation of the army's health, his role was reduced to that of an adviser. The final responsibility rested with the commanding officer. This advisory role placed singular demands on the medical department. A medical officer's sanitary advice, no matter how sincerely motivated or diplomatically expressed, implied censure. The line officer's pride could easily be wounded at the thought of a subordinate suggesting that his methods were enfeebling his own command.<sup>90</sup> The medical officer, on the other hand, needed to be sensitive to the line officer's point of view. Woodhull cautioned his fellow medical officers:

Such advice should never be tendered without occasion and always with the single motive of public good. Bearing this in mind, the utmost pains will be taken to avoid the least unnecessary irritation. To offer advice offensively may practically defeat the object. . . . However unpleasant it occasionally may be, it must always be recognized that in all military matters the ultimate responsibility rests upon that commanding officer.<sup>91</sup>

88. *Ibid.*, VI, 3085; III, 78.

89. Alfred A. Woodhull, "The scope of teaching that should be followed in the newly established chair of hygiene and sanitation in our military and naval schools, and the practical results to be expected therefrom," *J. Mil. Serv. Instrn. U. S.*, 1908, 42, 157-92.

90. Alfred A. Woodhull, "Direct responsibility for military health and sanitation," *Nat. Guard Mag.*, 1910, (May/June), pp. 3-14.

91. Alfred A. Woodhull, "The better type of medical officer," *Proc. Assoc. Mil. Surg. U. S.*, 1897, 7, 340-46, p. 345. Nicholas Senn echoed Woodhull's sentiments. N. Senn, "The qualifications and duties of the military surgeon," *J. Am. Med. Assoc.*, 1898, 31, 503-8.

Throughout the exhaustive proceedings of the Dodge Commission, most medical officers seemed reluctant to criticize line officers, despite the commission's assurances that all witnesses would be protected against retribution. In a typical case, an examiner tried to get Surgeon James D. Glennan to fix the responsibility for the "surplus amount of sickness," but he steadfastly refused. Finally, the frustrated questioner erupted: "I want to try to find out where the responsibility rests—on the corps, division, or brigade commander, the Secretary of War, or the President of the United States, or where it rests."<sup>92</sup> Clearly, the purpose of the questioning was not to elicit criticism of line officers in particular, but to establish the facts. Witnesses, on the other hand, were concerned about repercussions which could hurt their careers once the public furor over the war had passed. Under incessant prodding by the interrogators, courageous army doctors exposed the inequities of military culture, and the shortcomings of line officers. Surgeon Hartsuff candidly acknowledged that the Medical Corps shared the guilt for the typhoid epidemic, but he emphasized the culpability of line officers: "In my opinion the sickness at Camp Thomas was due largely to . . . the inexperience and inefficiency of the line officers, who did not furnish the support that should have been furnished . . . to the medical officers."<sup>93</sup>

The greatest source of friction, however, lay in the assignment of male nurses during the typhoid epidemic, which peaked in September 1898. At the start of the war the Hospital Corps was hopelessly undermanned, consisting of only 791 noncommissioned officers and privates. Of these, 250 were assigned to duty with the Fifth Army Corps when it left Tampa for Cuba. By 31 August 1898 the staff had been increased to nearly 6,000 men, but this was still only half the number required to care for an army of more than 200,000 men. Past experience suggested that hospital corpsmen should constitute five percent of the aggregate combatant force.<sup>94</sup> The shortfall meant that emergencies had to be met by temporary transfers from the ranks. Line officers continually detailed misfits, and medical officers

92. *Dodge Commission Report*, (n. 36) IV, 1038.

93. *Ibid.*, IV, 1147.

94. Dallas Bache, "The place of the female nurse in the army," *J. Mil. Serv. Instn. U. S.*, 1899, 25, 307–28. Philip A. Kalisch and Beatrice J. Kalisch, *The Advance of American Nursing*, 2nd ed. (Boston: Little, Brown and Co., 1986), p. 234. *Dodge Commission Report*, (n. 36) V, 1982.



had no alternative but to accept them.<sup>95</sup> Surgeon Rush S. Huidekoper noted that line officers, eager to get rid of their worst men and keep the best for more “important duties,” unloaded the former on the Hospital Corps. One regiment gave him an epileptic, and another a drunkard. Intelligent and capable men were discouraged from volunteering for hospital duty. Huidekoper overheard a colonel berate his men, claiming that “the only reason they made application to become nurses was because they were cowards.”<sup>96</sup> The head of the Second Division, Third Corps hospital at Camp Thomas, Surgeon George A. Smith, testified that, in his experience, many male nurses

were densely ignorant . . . I had two men who could neither read nor write, and three men who did not know what the meaning of a.m. and p.m. was, when written on the directions. . . . Whenever a captain made a detail for the hospital service, he picked out as a rule the worst men he could find, and saddled them on to the Hospital Corps. We had a good deal of trouble with drunkenness.<sup>97</sup>

The incompetency of corpsmen translated into human tragedy. Witness the anguished plight of George Hoover of Evanston, Illinois, who rushed to his son’s bedside at the Second Division Hospital in Jacksonville, Florida, only to watch him die of typhoid fever. Enraged by the ignorance of an orderly who did “not know what a bedpan meant,” Hoover shrieked, “My [two] boys have come here to die, if necessary, for their country, but not to die for want of care.”<sup>98</sup>

In the concluding chapter of the *Abstract on Typhoid Fever*, Walter Reed condemned line officers’ practice of assigning untutored enlisted men to hospital duty:

Each morning 100 men were detailed to attend those sick with typhoid fever, to place and adjust bedpans, and to carry the contents of these to the sinks and to disinfect them. These men . . . were wholly ignorant of the nature of infection; they had never had any training as nurses; they knew nothing about the desirability or necessity of being careful in order to prevent infecting themselves, and they knew less about means of disinfecting their hands soiled with typhoid discharges. At the close of the day these

95. *Dodge Commission Report*, (n. 36) III, 540, 556; VI, 2462–63. This practice can be traced back to the Revolutionary War. Mary T. Sarnecky, “Nursing in the American army from the Revolution to the Spanish-American War,” *Nurs. Hist. Rev.*, 1997, 5, 49–69.

96. *Dodge Commission Report*, (n. 36) V, 1745.

97. *Ibid.*, IV, 1532.

98. *Ibid.*, IV, 1564.

men were returned to their company tents, and the next morning a new detail of the same number went through with the same routine. A more effective means for the spread of typhoid fever could scarcely have been devised.<sup>99</sup>

Complaints about the deployment of unqualified privates, many of whom could not comprehend the danger of infection or the need to administer medicines at prescribed times, were so widespread that Surgeon General Sternberg concluded that the "system of securing so-called nurses by detail is a bad one and should be abolished."<sup>100</sup>

Typhoid cases needed expert nursing. It was exceedingly hard work, with no relief. Each patient required several cool baths daily (to reduce body temperature), in addition to attending to his nourishment, medications, bowel movements, and bedsores. Soiled clothes and bedding had to be changed. Delirious patients were particularly time consuming because they had to remain under constant observation.

By August 1898 the number of typhoid fever admissions had increased fifteen-fold, and the number of typhoid deaths twenty-five-fold.<sup>101</sup> As conditions deteriorated in the camps, hospital corpsmen were unable to handle the vast numbers of sick and dying, and the War Department had to look elsewhere for assistance. As a result, trained female nurses, all graduates of the nearly 200 nursing schools that had materialized in the aftermath of the Civil War, were accepted for the first time in United States Army hospitals. More than 3,200 women had nursed Union soldiers during the Civil War, but they were civilian volunteers without any formal training. Despite heroic efforts on the part of many of these women who were devoted to the welfare of the soldiers, the postwar Medical Department was not interested in their services. No effort was made to integrate female nurses into the military, and they disappeared from the army rolls after

99. Reed et al., (n. 24) *Abstract*, p. 229. The board recommended that the men detailed for hospital duty be selected by the regimental surgeons, who would be guided solely by the men's fitness to perform the special duties required. Further, the draftees should never serve for short periods of time, and extraordinary precautions had to be taken to prevent these men from carrying the seeds of infectious disease back to their regiments. Walter Reed, Victor C. Vaughan, and Edward O. Shakespeare, *Preliminary Report on Typhoid Fever in the Military Camps of the United States, 1898* (Washington, D.C.: Office of the Surgeon General, 25 January 1899; rpt., *Army Med. Bull.* No. 53, 1940, July, 73–103).

100. *Dodge Commission Report*, (n. 36) I, 171.

101. Bache, (n. 94).

1865. Three decades later they reemerged in the Spanish-American War.<sup>102</sup>

On 29 April 1898 Anita Newcomb McGee, a physician and vice-president of the Daughters of the American Revolution, was appointed by the surgeon general to direct the screening of female applicants to provide him with a list of qualified nurses. Only graduate, trained nurses with professional credentials, avowed good character, and proof of good health were accepted.<sup>103</sup> Nearly 5,000 applicants were screened, and about 20 percent accepted. McGee later attributed the success of the nurses to the high standards set by the selection committee.<sup>104</sup>

Careful nursing saved lives. By virtue of their schooling, female nurses were well versed in the germ theory of disease and antisepsis and understood the importance of scrupulous cleanliness, use of disinfectants, and the safe handling of infectious excreta.<sup>105</sup> That female nurses rarely contracted typhoid fever, in contrast to their untrained male counterparts, was vindication of the value of professional training for caregivers in close contact with contagious disease patients.<sup>106</sup>

Female nurses converted skeptics into advocates. Trained female nurses were praised by medical officers who believed them to be superior to their untrained male counterparts. By the end of the war, 1,563 women had served as contract nurses in the continental United States, Cuba, Puerto Rico, the Philippines, and Hawaii. The Spanish-American War proved to the Army that trained female nurses were indispensable caregivers and led to their permanent integration into the military. On 2 February 1901 the Army Nurse Corps (Female)

102. Mary T. Sarnecky, *A History of the U. S. Army Nurse Corps* (Philadelphia: University of Pennsylvania Press, 1999), pp. 12–24.

103. *Dodge Commission Report*, (n. 36) I, 725–26; VII, 3168–81. At the time, the Medical Department did not appreciate the value of trained female nurses, and intended to use them for menial duties. The typhoid epidemic changed all that. Ashburn, (n. 85) *Medical Department*, p. 207.

104. Sarnecky, (n. 102) *Army Nurse Corps*, p. 31. *Dodge Commission Report*, (n. 36) VII, 3176.

105. Eugene Flaumenhaft and Carol Flaumenhaft, “Four books that changed nursing.” *J. Hist. Med. Allied Sci.*, 1987, 42, 54–72.

106. *Dodge Commission Report*, (n. 36) III, 318, 395; VII, 3177. Of the 1,563 female nurses who served in the war only 140 (9% morbidity) contracted typhoid fever, and of those 12 were fatal. Ashburn, (n. 85) *Medical Department*, p. 207. In contrast, 19% of the males attending typhoid fever victims contracted the disease. Edward L. Munson, *The Theory and Practice of Military Hygiene* (New York: William Wood & Co., 1901), p. 686.

was established, and Dita H. Kinney was installed as its first superintendent.<sup>107</sup>

Medical officers lacked authority, line officers lacked interest, and no one was accountable. These were the ingredients for sanitary neglect and medical disaster. Typhoid fever, once introduced, spread rapidly and widely throughout the national assembly camps. These events of the Spanish-American War awakened the military establishment to the need for educational reform. To avoid the mistakes of the past, line officers needed specific training in military hygiene and camp sanitation.

#### HYGIENE INSTRUCTION AT THE UNITED STATES MILITARY ACADEMY

Analysis of military shortcomings during the Spanish-American War led to curriculum reform at the United States Military Academy at West Point, New York. For example, in 1902 the Academic Board, the governing body of the academy, lengthened the Spanish language course from 78 to 160 lessons. Fluency in Spanish had become important, since the army was charged with administering the Spanish-speaking territories acquired as a result of the Spanish-American War. Studies in French, mathematics, and natural philosophy were curtailed to make room in the tight schedule for the additional course work.<sup>108</sup> The most far-reaching change, however, the organization of the Department of Military Hygiene, resulted from the indisputable findings of Walter Reed and his collaborators, which caused considerable excitement within the military establishment.<sup>109</sup> Reed's scathing comments on the indifference of line officers to camp hygiene awakened authorities to the fact that sanitation was essential for the maintenance of military effectiveness and that hygiene instruction should be required at West Point.<sup>110</sup> As early as January 1899 Reed and his associ-

107. Sarnecky, (n. 102) *Army Nurse Corps*, pp. 49–53.

108. Roger H. Nye, "The United States Military Academy in an era of educational reform, 1900–1925" (Ph.D. diss., Columbia University, 1968), pp. 197–99.

109. Jane G. Brister, "Draft of history of army medical service at United States Military Academy, West Point, New York," 1949, pp. 389–412, p. 393. Medical Department Activity; Records of the Special Staff, 1818–1976; Records of the U. S. Military Academy, Record Group 404; National Archives—Affiliated Archives; record on deposit at the U. S. Military Academy Archives, West Point, NY. [Hereafter RG 404, NAAA].

110. Reed et al., (n. 27) *Report*, I, 664, 672. Although Reed is justly famous for his epochal yellow fever work, his typhoid studies, "from the standpoint of the soldier and the Army," Robert J. T. Joy contends, "may have been Reed's greatest contribution." Robert

ates had recommended that military hygiene be taught at the academy:

The officers of the line whose duty it is to look to the fighting strength of their men . . . should know the fundamental principles of health and prevention. There should be a professor of military hygiene and regular instruction in this subject in the regular curriculum at West Point . . . and all candidates for a commission in the regular army should be examined upon the subject and receive corresponding merit numbers, to be counted in the aggregates upon which their final standing depends.<sup>111</sup>

This point was hammered home at public forums by Vaughan and Sternberg. At the fourteenth annual convention of the Association of American Physicians, Vaughan remarked, "I honor the graduate of West Point and Leavenworth, but I think it is a shame and a crime that the line officers of our Regular army have no education as to sanitary knowledge."<sup>112</sup> The surgeon general commented that the causes of the typhoid outbreaks in the camps "may all be referred to ignorance on the part of officers of the elementary principles of camp sanitation and of their duties and responsibilities as regards the welfare of the enlisted men in their commands."<sup>113</sup>

Captain Peter E. Traub, a line officer with the Thirteenth United States Cavalry agreed with these sentiments: "Why do we permit history to repeat itself to the disgraceful extent that occurred in the Spanish-American War, one dead in battle to seven and one-half from disease? Why do we remain blind to the remedy? . . . The sovereign remedy is the *education* of officers and men in common sense hygienic principles."<sup>114</sup> It took the war with Spain and the typhoid epidemics in the assembly camps, Traub explained, to convince authorities that preserving the health of the army rested on the shoulders of the officers of the line.

On 19 August 1905, Surgeon General Robert M. O'Reilly (1902–1909) recommended that military hygiene be added to the curriculum at West Point. O'Reilly's decision was based on several factors: his intimacy with the Typhoid Board's writings, his understanding that

J. T. Joy, Review of *Walter Reed: A Biography* by William B. Bean, *N. Engl. J. Med.*, 1982, 307, 322–23.

111. Reed et al., (n. 99) *Preliminary Report*, p. 96.

112. Vaughan, (n. 39).

113. *Dodge Commission Report*, (n. 36) V, 1923.

114. Peter E. Traub, "Military hygiene: how best to enforce its study in our military and naval schools and promote its intelligent practice in our army," *J. Mil. Serv. Instrn. U. S.*, 1905, 36, 1–38, 6–7.

typhoid fever was still a serious threat to the efficiency of troops in the field, and his firsthand experience with the limitations imposed by the advisory role of medical officers regarding camp sanitation.

Ultimately . . . the responsibility for the sanitation of the Army rests upon the line, the Medical Department having no power to enforce their recommendations. Therefore the study of military hygiene should be enforced at the Military Academy at West Point, and I have recommended that it be made a part of the regular course at that school, counting for class standing and graduation.<sup>115</sup>

O'Reilly's specific proposals were (1) that a permanent department of military hygiene be established at West Point; (2) that a formal course of instruction be instituted with textbook assignments, recitations, examinations, and grades; (3) that military hygiene be given a merit rating in the general merit roll and count toward a cadet's standing in his graduating class; (4) that the instructor in military hygiene be the chief surgeon of the post, with the rank, pay, and emoluments of a lieutenant colonel; (5) that the instructor be a member of the Academic Board; and (6) that the instructor serve for a period of four years.<sup>116</sup>

On 8 September 1905 the Academic Board reviewed O'Reilly's recommendations and referred them to the committee on curriculum, chaired by Colonel Charles W. Larned, professor of drawing. Two weeks later Larned's committee returned a positive verdict, and on 27 September the Academic Board approved the surgeon general's scheme *in toto*.<sup>117</sup> Brigadier General Albert L. Mills, Superintendent of the United States Military Academy, then requested that the War

115. U.S. Congress, House of Representatives, *Report of the Surgeon-General*, in *Annual Reports of the War Department*. 59th Cong., 1st sess., House Document 2, (Washington, D.C.: Government Printing Office, 1905), Vol. 2, 176.

116. Although O'Reilly's original letter was lost, his recommendations were delineated in H. O. Perley to Charles W. Larned, 23 September 1905; File 5055-2; RG 404, NAAA. Military hygiene first appeared on the general merit roll of the graduating class of 1907. *Official Register of the Officers and Cadets, United States Military Academy* (West Point: United States Military Academy Printing Office, 1907), p. 30. The instructor of military hygiene was first listed as a member of the Academic Board on 2 November 1905. Minutes of the Academic Board, vol. 18 (4 May 1904-3 May 1907), p. 243; RG 404, NAAA. This was of great importance because it gave the instructor the opportunity to present and look after the interests of his department.

117. Minutes of the Academic Board, vol. 18, 231, 233; RG 404, NAAA. The vote was 13 ayes, 0 nays, and 1 absent. The curriculum committee's report is enclosed in Charles W. Larned et al. to the Adjutant, U.S.M.A., West Point, NY, 23 September 1905; File 5055-1; RG 404, NAAA.

Department issue an executive order to effect the resolutions of the Academic Board.<sup>118</sup> Shortly thereafter Secretary of War William H. Taft issued General Order No. 176, establishing the Department of Military Hygiene at West Point.<sup>119</sup> The senior medical officer at the academy was to be appointed head of the new department, and installed as a member of the Academic Board.<sup>120</sup>

Before 1905 military hygiene had been taught under the aegis of the Department of Chemistry, Mineralogy, and Geology. Cadets were not required to take notes, they were not graded, and the subject did not count toward their standing at graduation. These conditions were not conducive to learning. Taught in this fashion, the course was perfunctory, and the cadets “may be said to acquire a bowing acquaintance with the subject and nothing more.”<sup>121</sup> By making the subject compulsory, and a prerequisite for a commission, military hygiene became a legitimate part of military science. The object of teaching military hygiene to cadets was not to make them medical experts, but to expand their qualifications for command. Better educated line officers were part of the increasing attention to professionalism in the officer corps that took place after the Spanish-American War.

Lieutenant Colonel Harry O. Perley became the first chairman of the Department of Military Hygiene. He was responsible for supervising a series of ten lectures and ten recitations given to the Second Class (third-year students) from 15 April to 7 June 1906. In addition, cadets received practical training in first aid, camp sanitation, and cooking during summer camp.<sup>122</sup> American experience during the Cuban and Puerto Rican campaigns had shown that the use of first

118. A. L. Mills to the Military Secretary, War Department, 29 September 1905 and 13 October 1905; File 5055, Record Card; RG 404, NAAA.

119. War Department General Order No. 176, 19 October 1905. Several months before this Captain Traub had written, “The Secretary of War must act, for we do not think the Academic Board will, of its own initiative, recommend the establishment of such a course of study [military hygiene]. The Academic Board feels . . . that such a course should be entirely a post-graduate course, given at the special service schools, and it fails to remember that very few of the graduates, especially those in the infantry and cavalry, ever have a chance to attend the courses at those schools.” Traub, (n. 114).

120. The department was established on 21 October 1905. War Department. *Report of the Surgeon-General of the Army to the Secretary of War for the Fiscal Year Ending June 30, 1906* (Washington, D.C.: Government Printing Office, 1906). p. 130.

121. A. A. Woodhull, “Military hygiene,” *J. Mil. Serv. Instr. U. S.*, 1905, 36, 349–53, p. 352.

122. H. O. Perley to the Adjutant, U.S.M.A., West Point, NY, “Report on the Department of Military Hygiene,” 30 June 1906, RG 404, NAAA.

aid on the battlefield saved lives and was indispensable in modern warfare. In his report on the department's first-year activities, Perley proudly proclaimed that every cadet passed the course with flying colors.<sup>123</sup>

As had been customary in the past, line officers were detailed to temporary duty as hygiene instructors.<sup>124</sup> This, however, proved unsatisfactory. Line officers were incurious and had too little knowledge of the subject. Unable to supplement their lectures with examples from their own experience, they were content with regurgitating textbook material.<sup>125</sup> Under the new system, lectures were delivered by medical officers who remained part of the military staff of the post. As such, they were not members of the faculty and had no voice in decisions concerning teaching at the academy. Initially, the syllabus was much the same as it had been under the chemistry department, but marked changes in subject matter occurred once textbooks in military hygiene became available.<sup>126</sup> The outstanding American text of the time, Major Percy M. Ashburn's *The Elements of Military Hygiene Especially Arranged for Officers and Men of the Line* (1909), quickly became an integral part of the course.<sup>127</sup> Ashburn's landmark book stressed that line officers had to familiarize themselves with the sanitary problems created by camp life and that the prevention of disease could only be accomplished when officers and men of the line cooperated with medical officers in sanitary matters:

There can be little or no doubt that the sanitation of the army would be greatly improved if line officers and enlisted men should become more interested in the subject, and cooperate more freely and intelligently with medical officers in the efforts to promote it. This book is written in the hope that it may both inform and interest them and so gain for the medical

123. Nicholas Senn, *Medico-Surgical Aspects of the Spanish-American War* (Chicago: American Medical Association Press, 1900), pp. 294–308; Woodhull, (n. 43) *Military Hygiene*, pp. 215–17; Perley, (n. 122).

124. Perley, (n. 122). Assisting Perley in the initial course were four line officers from the mathematics department: Capt. William R. Smith, 1st. Lt. Archibald H. Sunderland, and 2nd. Lt. Wade H. Carpenter of the Artillery Corps; and Capt. Claude H. Miller, 24th U. S. Infantry.

125. Brister, (n. 109), p. 394.

126. Anon., "Instruction in hygiene at West Point," *J. Assoc. Mil. Surg. U. S.*, 1905, 17, 148; Brister, (n. 109), pp. 393–94.

127. For a complete listing of primary textbooks and principal reference works used by the Department of Military Hygiene from 1906 to 1914, see Vincent J. Cirillo, "The Spanish-American War and Military Medicine" (Ph.D. diss., Rutgers University, 1999), p. 115.



officer the sympathy and coöperation that he always needs, but now too seldom has.<sup>128</sup>

Ashburn was clearly influenced by the work of the Typhoid Board; his *Elements of Military Hygiene* is replete with references to the board's findings and their implications for the future of military hygiene. Ashburn emphasized that disobedient recruits and uncooperative line officers endangered not only their own health but that of the entire command. Military personnel had to be trained to accept sanitary policing as a source of pride and safety. He was also critical about the tendency of the officer corps to regard men who reported sick as trying to escape work. Ashburn admonished the officers, noting that it was better to have two or three malingerers than one man who was actually sick and could infect the whole command. "Nowhere is a man his brother's keeper to a greater degree than in an army."<sup>129</sup>

Ashburn argued that carriers were more dangerous than sick men, if only because they shared the same sleeping quarters and clothing and were assigned to kitchen duty and handled food—all without taking any precautions of disinfecting their hands, clothes, stools, and urine. Further, Ashburn anticipated the public health dilemma posed by healthy carriers; namely, how to protect public health while preserving that individual's personal liberty. Isolation of carriers, he opined, "is always attended with hardship to its subjects, and when controlled by laymen actuated by panic, fear, or malice, it may become an instrument of cruelty and oppression."<sup>130</sup>

In 1913 hygiene instruction (moved to the Third Class [second-year students] the previous year) covered selection of recruits, clothing and equipment, personal hygiene (bodily cleanliness, diet, exercise, and habits), camp sanitation (water supply and waste disposal), hygiene of mobile troops, food types and preparation, conservation of health in cold and hot climates, the causes of disease, preventable diseases

128. P. M. Ashburn, *The Elements of Military Hygiene Especially Arranged for Officers and Men of the Line* (Boston: Houghton Mifflin Co., 1909), preface, np. Woodhull echoed Ashburn's sentiments: "It is the camp and not the battle that at first and most seriously disables men. The prevention of very much of this disease lies in the hands of officers of the line. Medical officers can point out the methods of prevention, but their execution rests with the officers in actual command. By an intelligent application of their authority these can reduce the preventable disease to the minimum, and nearly all camp disease is preventable." Woodhull, (n. 43) *Military Hygiene*, p. 185.

129. Ashburn, (n. 128) *Elements of Military Hygiene*, p. 101.

130. *Ibid.*, p. 206.

of soldiers, control of epidemics, the sanitary duties of line officers, infections transmitted by insects (malaria and yellow fever), venereal diseases, and the untoward effects of alcohol and narcotics.<sup>131</sup> The goal was to kindle an appreciation for preventive medicine, the lesson being that it is better and *easier* to keep disease out than to drive it out once it has appeared.

Field sanitation, encompassing the latest methods and devices (incinerators) for disposal of human excreta and kitchen garbage, was introduced during the 1917 summer maneuvers. By then the thinking of military authorities had changed dramatically. In the past they were indifferent to sanitary matters, but now, on the eve of World War I, as "the causes and means of prevention of most transmissible diseases became matters of precise knowledge, commanding officers were charged with the responsibility for any unusual amount of disability among their men, due to preventable causes."<sup>132</sup>

#### CONCLUSIONS

During the Spanish-American War more than seven American soldiers died from bacilli for every one killed by enemy bullets. By 1898 the causative agent of typhoid fever, *B. typhosus*, had been identified, the Widal serodiagnostic test was available, the mode of transmission via infected feces was established, and effective preventive measures were known. Yet typhoid, a preventable disease, became the major killer of the war. The failure to protect the soldiers' health became a national scandal. The Reed-Vaughan-Shakespeare board concluded that camp pollution was the greatest sin committed by the troops in 1898 and that typhoid fever was spread chiefly by contact. Medical officers had little power to enforce sanitary regulations, and line officers with scant training in the value of camp hygiene proved largely uncooperative. Nursing care was another bone of contention, as officers released only their least competent soldiers for nursing duty. The tension between medical officers and line officers escalated, with tragic consequences for the health of American soldiers.

The events of the Spanish-American War awakened the military establishment to the need for health reforms. The army organized its first female nursing corps, drawing on the new population of

131. U.S.M.A., (n. 116) *Official Register*, 1913, p. 77.

132. Brister, (n. 109).

trained nurses being turned out by recently founded nursing schools. The Reed-Vaughan-Shakespeare report forced army officials at the highest levels to recognize that sanitation was essential for the maintenance of military effectiveness, and that history would repeat itself in the next war if line officers remained ignorant of the fundamentals of military hygiene and sanitation. With the establishment of the Department of Military Hygiene at West Point, military hygiene became a legitimate part of American military science.

The Spanish-American War also brought research opportunities. Although much was known about typhoid fever by 1898, some aspects of its transmission remained obscure. The congruence of particularly knowledgeable men, a research budget from the federal government, and an abundance of clinical material allowed for progress in understanding the multiple paths of typhoid fever. Reed, Vaughan, and Shakespeare discovered the role of healthy carriers and the importance of human contact and flies, greatly adding to the ability of future sanitarians to understand and control typhoid fever.