

*Occasional Notes***THE LAST SMALLPOX EPIDEMIC  
IN BOSTON AND THE VACCINATION  
CONTROVERSY, 1901–1903**

ONE hundred years ago, Boston had its last epidemic of smallpox. We describe this final epidemic, the controversy over compulsory vaccination, and ethical issues that remain relevant today.

**EPIDEMIOLOGY AND PROTECTION  
THROUGH VACCINATION**

In May 1901, an outbreak of smallpox, initially unrecognized, was followed by a series of outbreaks in various neighborhoods of Boston.<sup>1</sup> From 1901 to 1903, there were 1596 cases of smallpox (Fig. 1), with 270 deaths,<sup>1-3</sup> in a city with a population of approximately 560,900. The attack rate was 3 cases per 1000 persons, with a case fatality rate of 17 percent.

Of 243 consecutive patients with smallpox who were admitted to the smallpox hospital on Southampton Street, 18 (7 percent) were black,<sup>4</sup> although blacks made up only 2 percent of Boston's population in 1900.<sup>5</sup> Of the 238 patients whose birthplace was identified, 49 percent were immigrants, whereas only 35 percent of the city's residents were foreign-born<sup>5</sup>; Canadian-born residents, accounting for 21 percent of the patients, made up 9 percent of Boston's population at the time. During the epidemic, 60 percent of cases occurred in males.<sup>1-3</sup>

Among 754 patients with smallpox who had evidence of vaccination (Fig. 2), there were 82 deaths (case fatality rate, 11 percent), whereas among 842 unvaccinated patients, there were 188 deaths (case fatality rate, 22 percent). The law requiring that children be vaccinated in order to attend public school, which had been enacted by the state in 1855, appeared to be effective in providing protection against the epidemic. A review of 700 cases showed that 130 (19 percent) occurred in children 1 to 5 years old, but only 21 (3 percent) occurred in children 6 to 10 years old<sup>6</sup>; the number of children in each age group was similar.<sup>5</sup>

**EFFORTS TO CONTROL THE EPIDEMIC**

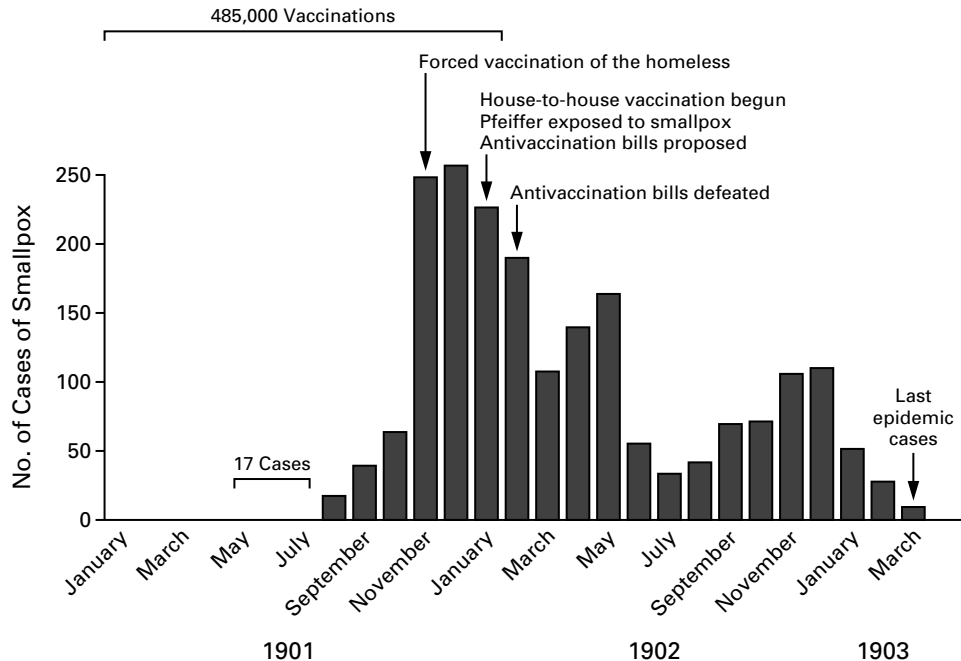
In the fall of 1901, the Boston Board of Health took steps to control the epidemic. Dr. Samuel Holmes Durgin, a member of the Harvard Medical School faculty, was chairman of the board.<sup>7,8</sup> All patients with smallpox, except those who were extremely ill, were taken to special facilities.<sup>1</sup> A detention hospital on Southampton Street served as the main hospital. When additional beds were needed, the quarantine facilities on Gallop's Island, in Boston Harbor, were hastily expanded. The Boston Health Department conducted

a program of "thorough disinfection, vaccination and revaccination of all persons who have been in contact or exposed to the patient, and surveillance of the suspects for two weeks."<sup>9</sup>

A general program of voluntary vaccination was initiated. Free vaccination stations were established, and physicians visited businesses to vaccinate employees. Vaccination was performed with the use of glycerinated liquid vaccine or vaccine dried on an ivory or bone "point."<sup>10</sup> Vaccine obtained from humans ("humanized" vaccine), transmitted from person to person, was believed to be a source of transmission of other infectious diseases, and by 1900, the virus was usually propagated on the skin of heifers on commercial "vaccine farms."<sup>11</sup> However, there was no regulation of the production and quality of smallpox vaccine. An editorial in the *Boston Medical and Surgical Journal* conceded that some vaccine manufacturers practiced "unscrupulous methods" of production and advertising.<sup>12</sup> Legislation enacted shortly after the epidemic had ended provided for state-sponsored production of vaccine.<sup>13</sup> Federal legislation enacted in July 1902 regulated the manufacture of vaccine for interstate sale.<sup>14</sup> Although generally safe, vaccination had risks. Generalized vaccinia, ulceration, abscess formation, cellulitis, secondary sepsis, and tetanus were potential complications.

By December 1901, more than 400,000 Bostonians had been vaccinated. Nonetheless, continued reports of smallpox cases led the Board of Health to order that "all the inhabitants of this city who have not been successfully vaccinated since January 1, 1897, be vaccinated or revaccinated forthwith."<sup>15</sup> A program of house-to-house vaccination was initiated in January (Fig. 3), with physicians sent to the most affected areas of the city: East Boston, South Boston, Charlestown, the North End, the West End, and parts of Roxbury and Dorchester.<sup>1</sup> The instructions given to the physicians were as follows: "Vaccinate all who are willing and are not too ill. No force to be used. Make skin clean before vaccinating. Make two scarifications. Make no scarification more than one-fourth inch in diameter. Do not make the blood flow. Rub the lymph well into the wound and secure its drying. Caution [the patient] carefully against breaking the vesicle or doing other injury."<sup>17</sup> Persons who refused vaccination were subject to a \$5 fine or a 15-day jail sentence.<sup>16</sup>

The homeless were blamed for spreading smallpox. A 1904 editorial in the *Lancet* stated, "What a potent factor in maintaining the prevalence of smallpox is that unemployed and largely unemployable degenerate [person]. . . . The fact that this parasite upon the charity and good nature of the community is in his turn a vehicle for the spread of other parasites, both animal and vegetable, is common knowledge but practically no compulsory steps have been taken to curtail seriously the vagrant's move-



**Figure 1.** Distribution of Smallpox Cases in Boston during the Epidemic of 1901 through 1903. Data are from the annual reports of the Boston Health Department.<sup>1-3</sup>

ments.”<sup>18</sup> In November 1901, the Boston Board of Health ordered “virus squads” to vaccinate men living in inexpensive rooming houses.

A reporter for the *Boston Globe* accompanied a squad one night and described the scene: “Every imaginable threat from civil suits to cold-blooded murder when they got an opportunity to commit it, was made by the writhing, cursing, struggling tramps who were operated upon, and a lot of them had to be held down in their cots, one big policeman sitting on their legs, and another on their heads, while the third held the arms, bared for the doctors.”<sup>19</sup> One “fighting tramp,” who “went down in a heap on the floor” from the blow of a policeman’s club, received both vaccination and suturing of his scalp. In hearings on compulsory vaccination, opponents alleged that in Massachusetts, boards of health “in many cases had acted with autocratic power and forcibly assaulted persons to vaccinate them.”<sup>20</sup>

#### OPPONENTS OF COMPULSORY VACCINATION

The Board of Health was concerned about criticism by the Anti-Compulsory Vaccination League and considered Boston “practically a hot-bed of the anti-vaccine heresy.”<sup>21</sup> Opponents of vaccination questioned its safety and efficacy. They believed that compulsory vaccination was a violation of civil liberties

and that “from the standpoint of free citizenship no government should forcibly inflict on any individual enjoying all other rights of the nation, a disease [vaccine] loathsome in its origin, and not free from danger to life, and with, at all events, impairment of bodily health, at least of a temporary nature.”<sup>22</sup>

In January 1902, legislation was proposed to repeal the state’s compulsory-vaccination laws. The leading opponents of vaccination, including a number of physicians, testified in favor of the legislation.<sup>23</sup> Arguing against the proposed repeal were prominent physicians, business leaders, and educators, including William Councilman, a pathologist at Harvard Medical School, and Frank Draper, the president of the Massachusetts Medical Society at the time. Those who supported vaccination prevailed, and in February, “all the antivaccination bills were reported adversely.”<sup>24</sup>

This epidemic led to a landmark legal case on the constitutionality of compulsory vaccination.<sup>25,26</sup> In *Jacobson v. Massachusetts*, a citizen challenged a Massachusetts law that allowed the Cambridge Board of Health to fine him for refusing revaccination. Jacobson argued that the law opposed “the inherent right of every freeman to care for his own body and health in such a way as to him seems best.”<sup>25</sup> In 1905, the U.S. Supreme Court voted seven to two in favor of the state, ruling that although the state could not pass laws requiring vaccination in order to protect an in-



**Figure 2.** Day 10 of Smallpox in a 34-Year-Old Man.

The patient, an immigrant, had been successfully vaccinated in infancy, and a scar is visible on his left arm (arrow). He was described as “well” on discharge two weeks later. Photograph and data are from the clinical records of the Southamptton Street smallpox hospital.<sup>4</sup> Photograph provided courtesy of the Boston Medical Library in the Francis A. Countway Library of Medicine.

dividual, it could do so to protect the public in the case of a dangerous communicable disease.

#### THE PFEIFFER AFFAIR

In November 1901, Durgin (the chairman of the Boston Board of Health) posed an extraordinary challenge: “If there are among the adult and leading members of the antivaccinationists any who would like an opportunity to show the people their sincerity in what they profess, I will make arrangements by which that belief may be tested and the effect of such exhibition of faith, by exposure to smallpox without vaccination, be made clear.”<sup>27</sup>

In January 1902, Dr. Immanuel Pfeiffer, a Danish immigrant, requested that he be allowed to visit a smallpox hospital, ostensibly to study the disease, without undergoing vaccination. Pfeiffer, a physician who advocated fasting and hypnotism, was at one

time president of the American Psychic Society.<sup>28</sup> A vehement critic of the Board of Health, he apparently thought that people in good health were not at risk for contracting smallpox — a belief that was not representative of the views expressed by those who opposed vaccination. The Pfeiffer bill, which would have required “obtaining the consent to inject any poisonous substance into the body of any person,”<sup>29</sup> was one of the antivaccination bills voted down in February 1902.

The 60-year-old Pfeiffer had not been vaccinated since infancy. In an unprecedented move, Durgin lifted the strict requirement of recent, successful vaccination for all health workers entering the Gallop’s Island smallpox hospital. Pfeiffer visited the hospital on January 23, 1902, and was escorted among more than 100 patients with smallpox by the physician in charge, Dr. Paul Carson, who reportedly suggested that he smell the odor of a patient’s breath.<sup>28</sup> Health officers surreptitiously observed Pfeiffer after the visit, and on February 8, 1902, he was found to be critically ill in his home in Bedford. The following day, the headlines read, “Pfeiffer Has Smallpox. Antivaccinationist May Not Live.”<sup>30</sup> Physicians on the Board of Health initially predicted that Pfeiffer would die, but he survived. Durgin publicized the fact that no cases of smallpox had occurred among the recently vaccinated physicians who had visited the hospital. The press acknowledged his triumph: “Chairman Durgin comes up smiling.”<sup>31</sup> An editorial stated, “It is a salutary lesson to the anti-vaccinationists, and it is destined to live in the annals of preventive medicine.”<sup>32</sup>

It is far from clear that the incident served as a “salutary lesson.” Pfeiffer’s theories on smallpox were his own, and opponents of compulsory vaccination were among those who condemned his “foolhardiness.”<sup>33</sup> One newspaper article questioned the ethics of Durgin’s actions: “Was Dr. Durgin right in allowing Dr. Pfeiffer to visit the hospital without being vaccinated? . . . ‘It was the right thing to do, as it was good for the greatest number,’ was the cool, analytical response of the chairman of the board of health.”<sup>34</sup> The Board of Health had not placed Pfeiffer under any restrictions after his exposure at Gallop’s Island. The town of Bedford considered suing the city of Boston, charging that smallpox had been “imported because of the inexcusable negligence of the health authorities of Boston.”<sup>35</sup>

#### EPILOGUE

After the epidemic ended, in March 1903, there were sporadic cases of smallpox in Boston. A total of 108 cases, 4 of which were fatal, were reported between October of that year and 1932, when the last case occurred.<sup>36</sup> The controversy over vaccination persisted. After a failed attempt in 1926 to extend compulsory smallpox vaccination to children attend-

BOSTON GLOBE—TUESDAY, JANUARY 28, 1902.

## ABOUT 10,000 VACCINATED IN SOUTH BOSTON.

Board of Health Had 115 Physicians at Work—It Intends to Bring Those Who Refuse Into Court.



Figure 3. Illustration of House-to-Home Vaccination. The illustration is from the *Boston Globe*, January 28, 1902.<sup>16</sup>

ing private schools, a Boston Health Department report complained bitterly about “active antivaccination propaganda.”<sup>37</sup> Smallpox made its final appearance in the United States in 1949, in Hidalgo County, Texas. In 1971, with no cases having been reported in the United States in the previous 22 years but with six to eight deaths per year due to complications of vaccination, the U.S. Public Health Service formally recommended the discontinuation of routine vaccination.<sup>38</sup>

This epidemic illustrates the importance of applying modern medical science (in this case, vaccination) to an acute public health problem, educating the medical community and the general public about the benefits of prevention, and having public debate on the pros and cons of public health policies aimed at prevention. Some aspects of the epidemic remain disturbing. The Board of Health’s policy toward the homeless and the challenge to those who opposed vaccination to expose themselves to smallpox showed a disregard for civil liberties and for ethical concerns. Such abuses underscore the importance of an ethical framework

for public health and medicine that includes the oath to “do no harm,” respect for individual autonomy, and the requirement of informed consent.

With advances in the safety and efficacy of vaccines and a greater understanding of the immune system, public approval of vaccination increased in the 20th century. Ultimately, a concerted worldwide campaign based on immunization, surveillance, and containment of disease would achieve the goal of eradicating smallpox, which Edward Jenner had contemplated two centuries earlier.<sup>39,40</sup>

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