
Smallpox and Vaccination in Cuba (1911)

(P. Villoldo)

COMMENTARY

Stephen S. Morse, PhD

It has been stated that more people died from smallpox than from all the wars in history. Indeed, the historian William McNeill suggested that it was the smallpox the Europeans inadvertently brought, and not superior force of arms, that allowed them to conquer Montezuma's empire.

It can be appreciated, then, how revolutionary vaccination was when it was introduced. Before Edward Jenner, "variolation" and other methods using human smallpox offered protection, but with some risk and considerable difficulties. Jenner's demonstration in 1796 of vaccination using cowpox allowed the production of vaccine without obtaining lesions from human smallpox cases. (Indeed, the term "vaccination" is derived from the Latin word for cow.) While Jenner's discovery was originally ridiculed, it gained rapid acceptance after members of the British Royal family requested vaccination, and the practice eventually became widely adopted.

But when did the idea of eradication first seem feasible? This paper clearly demonstrates how easily smallpox could be introduced into an immunologically naive population, and how effectively it could be controlled through vaccination and surveillance. In those days, it was possible to consider only local "eradication," as the infection was globally widespread and reintroduction frequent. Therefore, universal immunization of the local population was practiced to ensure a sufficient level of population immunity. (The formal notion of "herd immunity" was yet to come.)

The author of this paper clearly knew he and his colleagues were on to something important. Through rigorous application of these same techniques of universal vaccination and surveillance, smallpox became increasingly rare in much of the world. In 1967, the World Health Assembly finally resolved to end the greatly feared scourge of smallpox forever. In a stunning international effort, countries collaborated to implement a worldwide vaccination campaign, led by the efforts and dedication of D.A. Henderson, William Foege, and others. Smallpox was officially declared eradicated at the end of 1979. Today, it stands as a great milestone in public health: the first (and, so far, only) infectious disease to be eradicated as the result of human action.

Smallpox, horrible as it was, is one of the relatively few diseases truly amenable to eradication. The virus has no natural reservoir outside humans, and the vaccine is highly efficacious, as demonstrated in this report. Ironically, in the last few years, the specter of smallpox has returned with the thought that bioterrorists could obtain and use the virus for nefarious purposes against a population that is again largely immunologically naive.

The control and eventual eradication of smallpox also led to another unintended consequence: a feeling among many that infectious diseases could be consigned to the past. With the coming of AIDS shortly afterward and the recurring threat of emerging infections, we belatedly recognized that infectious diseases could be controlled and sometimes even eradicated, but not ignored. We cannot afford to be complacent. The determination evident in this article demonstrates the public health vigilance and dedication that must be maintained if we are to prevail over infectious diseases.

Stephen S. Morse is Founding Director of the Center for Public Health Preparedness and Associate Professor of Epidemiology at the Mailman School of Public Health, Columbia University. He was the editor of Emerging Viruses (Oxford University Press, 1993), was the founding Chair of ProMED (the Program to Monitor Emerging Diseases), and serves on the Steering Committee of the Forum on Microbial Threats at the Institute of Medicine-National Academies of Science.

SMALLPOX AND VACCINATION IN CUBA

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By P. Villoldo, acting assistant surgeon, United States Public Health and Marine Hospital Service, Habana

The history of smallpox in Cuba affords another conclusive proof that it is within the power of any community to eradicate the disease by means of vaccination.

Smallpox had been endemic throughout the island, cases having been imported time and again by the Spanish Transatlantic Line, often by Spanish troops. No records of the number of cases of smallpox which occurred in the island during the Spanish domination are available, but the accompanying table of deaths due to smallpox in the city of Habana, covering a period of 30 years, will illustrate the almost continuous prevalence of the disease.

Mortality from smallpox in Habana from 1870 to 1900.

Years.	Deaths.	Years.	Deaths.
1870.....	681	1886.....	0
1871.....	1,126	1887.....	1,654
1872.....	174	1888.....	550
1873.....	47	1889.....	7
1874.....	772	1890.....	12
1875.....	711	1891.....	151
1876.....	106	1892.....	0
1877.....	97	1893.....	8
1878.....	1,225	1894.....	210
1879.....	523	1895.....	181
1880.....	446	1896.....	1,004
1881.....	706	1897.....	1,404
1882.....	1	1898.....	168
1883.....	5	1899.....	4
1884.....	1	1900.....	2
1885.....	0		

The epidemic of 1887-88, which had its starting point in troops just arrived from Spain, was extinguished by the efforts of the mayor of the city and the medical profession. The physicians of the town undertook to vaccinate gratuitously the whole population of the city, for which purpose they divided themselves into small groups and went from house to house, with the result which may be seen in the following table showing the number of deaths by months:

	1887	1888	1889
January.....		271	
February.....		128	1
March.....		47	
April.....		57	
May.....	22	18	1
June.....	55	15	2
July.....	116	6	2
August.....	209	3	1
September.....	277	3	
October.....	305		
November.....	298		
December.....	372	2	

Vaccination was introduced into Cuba in the year 1804, and that same year a vaccination board was instituted with semiofficial character, but the use of vaccination was very limited, and it encountered much opposition, as has been the case in other countries. In the year 1841 the vaccination board was made a dependency of the superior board of health and regulations were enacted providing that no one should be admitted to the schools or university or employed in workshops or stores without a vaccination certificate.

In 1868 Dr. Luis Ferrer introduced animal vaccine in Cuba. So far only human vaccine virus had been in use. Dr. Ferrer brought some inoculated calves from Europe at his own expense, made a vigorous campaign to popularize animal vaccine, and published a paper entitled "El Propagador de la Vacuna." As a result of this campaign, a large number of people submitted to the operation at the vaccination institute which he had founded. An official vaccination center was established in Habana in the year 1878 at which animal vaccine was produced, and similar institutions were created in the cities of Matanzas and Cardenas. In the town of Puerto Principe it became customary to vaccinate the children in the churches at the same time that they were baptized.

On account of the smallpox epidemic which took place during the years 1887 and 1888 a new vaccination law was promulgated which required every inhabitant in the island to be vaccinated. As may be seen from the foregoing, vaccine virus was available in Cuba at an early date, and legislation on the matter had gone very far, making vaccination compulsory for everyone, but owing to the opposition of some, the ignorance of many, and the apathy of the authorities, vaccination was practiced on a very moderate scale during the Spanish times, except in the presence of severe epidemics.

During the last few months of the year 1898 the United States occupied Cuba and one of the early considerations was the improvement of the sanitary conditions of the island. In many of the cities compulsory vaccination was enforced.

On January 29, 1901, a commission was appointed to revise the vaccination law of 1887 and to recommend such measures as it might deem necessary to insure vaccination and revaccination in the island of Cuba. As a result of the work of this commission, on June 24, 1901, the new vaccination law was put into effect by the military governor of Cuba.

The following are the requirements of this law, which is still in force:

1. Vaccination and revaccination are obligatory for all the inhabitants of Cuba.
2. All children shall be vaccinated before they are 1 year old. If the first vaccination is not successful, a second trial shall be made within a month, and if this fails a last one at the end of a year.
3. Within four months from the 1st of August, 1901, all persons, 1 or more years old, who have never been successfully vaccinated, shall be vaccinated. If the first trial fails, a second shall be made within a month.
4. All children vaccinated under article 2, whether successfully or unsuccessfully, shall be revaccinated within their eighth year; if the first trial fails, a second shall be made within a month, and if this fails a last one when 10 years old.
5. All children who have been successfully vaccinated between the ages of 1 and 13 years and never revaccinated shall be revaccinated before the expiration of the eighth year after vaccination. If the first trial fails, a second shall be made within a month.
Revaccination shall be enforced only in persons who were vaccinated before the age of 13 and therefore shall never be required in persons more than 20 years old except as provided in article 6.
6. Whenever in any municipality the authorities under report of the board of health or of the municipal physicians declare smallpox to be prevalent or epidemic, all persons residing therein shall be vaccinated who can not prove previous successful vaccination within three years.
7. Upon the provincial and the municipal authorities shall devolve the duty of carrying the above provisions into effect through the boards of health, municipal physicians, and official vaccinators.
In each municipality not exceeding 20,000 inhabitants, a competent physician shall be appointed official vaccinator by the vaccination commission upon the recommendation of the alcalde (mayor). In the municipalities exceeding 20,000 inhabitants, two or more competent physicians shall be thus appointed official vaccinators and assigned to their respective districts by the alcalde (mayor).
As many assistants as may be required by each official vaccinator, not to exceed one for each 3,000 inhabitants, shall be appointed upon recommendation by the alcalde (mayor) and discharged whenever their services are no longer needed or desired.
All cases of smallpox shall be promptly reported by the alcalde (mayor) to the centro general (central office).
8. All persons shall have entire freedom in the choice of the physician to vaccinate or revaccinate them, and the private physicians may charge for the operation the fees they may deem proper.
9. The centro de vacuna (vaccine institute) of the Province of Habana, in the city of Habana, shall be extended and become a centro general de vacuna; no other centro de vacuna shall be officially recognized or supported at public expense. It shall be in charge of a director.
The centro general shall prepare and distribute the virus needed for the whole island, collect all reports and certificates, and compute all statistics. The director shall issue a brief monthly bulletin and an annual report, showing the number vaccinated and revaccinated in the whole island (classified according to locality, age, race, and sex), the result obtained (relative number of successful and unsuccessful cases), the number of calves inoculated, quantity of virus produced at the centro and distributed to each municipality.
10. All necessary virus may be obtained by private physicians, as well as by official vaccinators, from the centro general, free of charge, by requisition in writing upon the director, stating the number of persons for whom it is wanted and the municipality. The receipt of it shall be promptly acknowledged.

Virus from any reputable private institution may also be used by private physicians if preferred.

12. For each person vaccinated or revaccinated the operator (private physician, official vaccinator, or assistant vaccinator) shall prepare, in triplicate, a certificate on the printed form furnished for the purpose, the first or outside copy to be delivered to the person interested, the second or middle copy to be retained by the official vaccinator or delivered to him, and the third (stub) to be retained in the book. When the book of certificates is exhausted it will be turned over to the official vaccinator and kept in the records of the alcaidia (mayor's office).
15. All adult persons, and in case of minor children fathers or guardians, as well as responsible heads of institutions, who fail to comply or cause compliance with the provisions of this order, shall be punishable as follows:
 For the first offense a fine of \$5 and for each month thereafter that elapses without remedying the offense a like fine, increased at the rate of \$5 monthly. In case of failure to pay the fine, the person convicted shall suffer subsidiary imprisonment at the rate of one day of imprisonment for each dollar of fine.

The vaccination center was installed in a suitable building and vaccination was continued on a large scale, 265,000 persons being vaccinated from September, 1901, to January, 1902. The result of this work was that by the end of the year 1901 Cuba was free from smallpox. The disease has not reappeared up to this date, but vaccination has been continued at the following rate:

Annual vaccinations.

1902 (Feb. to Dec.).....	22, 980	1907.....	43, 371
1903.....	31, 384	1908.....	38, 619
1904.....	31, 559	1909.....	71, 949
1905.....	55, 197	1910.....	80, 131
1906.....	39, 263		

Besides this, the quarantine service has vaccinated 38,953 individuals in the last five years. All of these vaccinations have been practiced with virus prepared at the centro general de vacuna in Habana under the direction of Dr. Vicente de la Guardia, without any complication having been reported to date. In an average based on the results of three consecutive years, it is found that the inoculations with this virus have been successful in 75 per cent of the vaccinations and in 36 per cent of the revaccinations.

It may be well to mention an interesting case which took place in the year 1904 at Las Animas Hospital, which is used as an isolation hospital for the city of Habana. A patient who arrived at Habana on the steamship *La Navarre* suffering from smallpox was taken to the hospital. On the entrance of the case at the hospital the personnel of the institution was vaccinated, excepting the gardener, who was opposed to this procedure and who managed to avoid vaccination. Although from the nature of his work he had nothing to do with the patient, he contracted the disease and died a few days after from hemorrhagic smallpox. The original case recovered and no further cases of smallpox occurred. Cases of smallpox which arrive at the port of Habana are not now taken to Las Animas Hospital, but sent to the Mariel lazaretto by sea.

It is now 10 years since smallpox was eradicated from the island, and the Cuban sanitary department is preparing a more stringent vaccination law in order to insure the continuance of a practice which has been attended with such good results.